

## technology review

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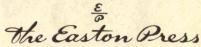
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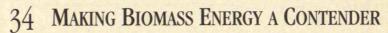
BY EDWIN DIAMOND AND STEPHEN BATES

The frontier known as the Internet, cherished by its denizens as a haven for diverse interests and anything-goes tolerance, has been the object of a variety of legal and regulatory battles—largely on First Amendment issues—led by those who would tame it.

#### FILTERING THE NET

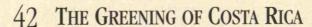
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Internet users can take advantage of the electronic medium itself to shield themselves from obnoxious online speech—without censoring anyone else.



BY GEORGE STERZINGER

The technology for turning trees and other plants into a gas and using it to power a jet engine shows promise as an economical way to produce electricity. Modest public and private investment could make this significant but largely untapped energy source, which produces no net emissions of greenhouse gases, a commercial reality.



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Costa Rica is determined to make itself the first test case of sustainable development. By taking ambitious steps to preserve its extraordinary biodiversity, the country hopes to prove that such an effort goes hand in hand with raising its standard of living.

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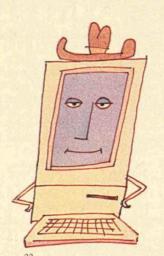
BY STEPHEN S. MORSE

As the world's population becomes ever more mobile, diseases that erupt in one location can quickly span countries and even continents. A comprehensive global system—for early warning, communications, diagnosis, prevention, and control—could go a long way toward limiting these emerging public-health threats.

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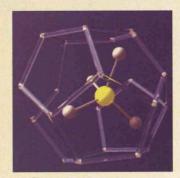


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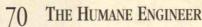
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Harvesting Natural Gas from the Ocean Floor
Data in Venice: Saving Outdoor Art



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Humble "technologies" like the pillow epitomize not only rest but energy—
the quest for comfort that drives us toward creativity, ingenuity, and enterprise.

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Technology Review (ISSN 0040-1692), Reg. U.S. Patent Office, is published eight times each year (January, February/March, April, May/June, July, August/September, October, and November/December) by the Association of Alumnia and Alumnae of the Massachusetts Institute of Technology. Entire contents © 1995. The editors seek diverse views, and authors' opinions do not represent the official policies of their institutions or those of MIT. We welcome letters to the editor. Please address them to Letters Editor, c/o address below or by e-mail to: <technology-review-letters@mit.edu>.

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#### Love Is Necessary **But Not Sufficient**

ACK in the 1960s, when I was the proud owner of a funky little Volkswagen "bug"-my first new car out of college—one of my coworkers suggested that I perform my own maintenance, and he volunteered to show me how. Such things as oil changes, tuneups, and valve adjustments were easy, he argued, on this relatively simple machine, and I'd save some money.

At first I resisted. With neither the experience nor the inclination to get down there with the hardware, I told him, "I just don't have the skill." Not to worry, he answered. You care about that car much more than a mechanic does. "What you lack in skill you make up for in love."

That convinced me, and for several years I maintained the car myself. I did it no damage—in fact, it seemed to run fine—but I could never avoid high anxiety every time I set out, tools at the ready, to open the hood. What if I made some disabling error? Or what if at first the effort seemed to go well but the car suffered a breakdown on the road? Eventually, I realized that my inability to correct such outcomes was unlikely to change, and VW mechanics once again got my business. I provided the love (and cash); they provided the skill.

All this reminded me of the difference between nervous dilettantism and confident mastery—commitment, backed up by ample allocations of time and resources. Admittedly, most people don't need to become full-fledged mechanics to perform simple automotive upkeep tasks, but as car technology becomes more complex, the number of "simple" procedures shrinks and we are obliged to seek specialists. In a modern technological society, where we must rely on a wide spectrum of skilled men and women, it is essential that we invest wisely, and well in advance, so that they will be there when we need them.

For an awesome depiction of individual skills and their interdependence—of investments paying off—consider the recent movie hit Apollo 13. Its story, based on an actual 1970 event, shows three exceedingly competent astronauts, backed up by a battalion of resourceful technicians on earth, surviving a nearcatastrophic accident en route to the moon and improvising a life raft, along with other on-the-spot innovations that bring them safely home.

The U.S. can't produce skill, or attain leadership, simply by ardent wish.

Or consider a more recent demonstration of know-how: the survival and evacuation this past June of Capt. Scott O'Grady—shot down in hostile territory in Bosnia, eluding capture for six days, establishing electronic communication with his colleagues, and then being plucked, quickly and precisely, from his ordeal.

Talk about handling a "breakdown on the road." Talk about true combinations of love and skill. If these individuals could so calmly address the decidedly nonroutine in such inhospitable and lifethreatening environments far from home, why couldn't I approach, free of apocalyptic visions, a well-functioning little VW engine in the safety of my own driveway?

Some would assert that ordinary riskaverse mortals should never compare themselves with astronauts, military pilots, and others who are supposedly "a breed apart" that is outright risk-seeking. But I'd suggest that their coolness under fire derives less from superhuman fearlessness than from a profound familiarity with what they do, the result of years of training and devotion. Their knowledge and long experience give them the confidence that if anything goes wrong, they can fix it. Thus their modesty—Capt. O'Grady, for instance, insisted that he was not a hero-is genuine. They don't see themselves as extraordinary, just as extremely well-educated people doing their jobs.

Government has an obvious role in the cultivation of "the right stuff" among individuals such as astronauts who are directly serving their country. But government also plays at least an indirect role in ensuring that most modern ventures, in space or on the ground, in circumstances unusual or mundane, are rewarding. For our ultimate technological and economic strength as a nation, we rely on the wisdom and foresight of our leaders to ensure that a wide range of sophisticated skills, both established and emerging, are being nurtured.

Government has lately seemed to take that responsibility less seriously. Proposals in Congress and from the White House, for example, would substantially trim the nation's civilian R&D budget. But as MIT President Charles M. Vest observed in a recent speech at the National Press Club, such funding is an investment in our future. Without proper support of research and education, he warned, shortsighted officials will compromise the country's next generations

of "human capital."

A New York City bank used to counsel in its ads, "Wishing won't make it so, saving will." Similarly, having a sincere wish to do something-the "love"won't suffice unless one invests the time, effort, and resources to gain the skill that turns the wish into reality. I like to think that my lack of car-maintenance savvy, for example, reveals not a genetic defect but the fact that my priorities lie elsewhere, and that if having such skill were truly important to me, I'd commit myself over the long term to acquiring it. The point is just as applicable to nations. If we really want something-say, U.S. technological and economic leadership—supportive words, however eloquent, are simply not enough. Another expression of my urban youth summed up the real requirement with streetwise conciseness: "Put ya money where ya mouth is."

—STEVEN J. MARCUS

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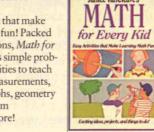


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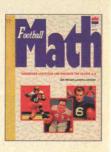


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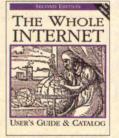
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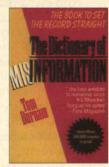
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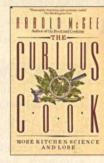


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## Letters

#### SNIPPING CLIPPER

Dorothy Denning's "Resolving the Encryption Dilemma: The Case for the Clipper Chip" (TR July 1995) is an example of flogging a dead horse. The author's arguments asserting the government's benevolence are entirely superfluous. And contrary to Denning's argument that users will not use encryption software available on the Internet, such software is comparable to—or better than—most commercial products. Furthermore, the Internet is not the sole source of quality encryption software. "A Method for Obtaining Dig-



ital Signatures and Public Key Cryptosystems" (Communication of the Association for Computing Machinery, February 1978), one of the earliest descriptions of the RSA algorithm, would enable even a marginally compe-

tent programmer such as myself to devise a viable encryption program within a few months. Clipper would simply mean that government sleuths would spend the taxpayers' dollars eavesdropping on trivial communications that did not merit encryption in the first place, and it would also succeed in destroying whatever remains of the First Amendment.

Bernard H. Geyer Prescott, Ariz.

Despite Dorothy Denning's arguments, Clipper is dead. It was killed by government hubris and advancing technology. More than 15 escrowed encryption schemes already exist; many are less expensive and less vulnerable to rogue government than Clipper. More than 1,000 encryption products are available in 34 countries worldwide. Detailed lists of these products are available on the World Wide Web at <a href="http://www.tis.com/crypto/crypto-survey.html">http://www.tis.com/crypto/crypto-survey.html</a> or in

my book, Building in Big Brother (Springer-Verlag, 1995).

Modern cryptographic theory provides communications and records that the government cannot access, even when properly authorized. If society decides that users do not always have a right to private communication, then an encryption key could be broken up and stored with escrow agents (possibly government-authorized) who are available around the clock and charge users (instead of the government) a service fee.

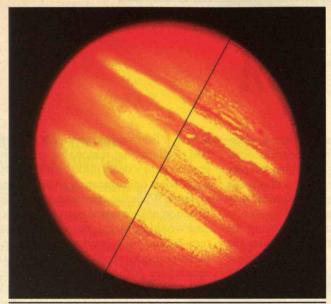
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Although Dorothy Denning lists Clipper's numerous protections, she overlooks a fundamental weakness in the escrowed encryption process: obtaining a court order to conduct a wiretap is too easy. None of Clipper's inherent safeguards can prevent unreasonable authorized wiretaps.

Non-escrowed encryption schemes are a better choice because only the government's ability to eavesdrop from a central point would be fatally weakened. If strong suspicion exists, the government can still conduct wiretaps by physically planting equipment in the suspect's immediate vicinity. With escrow systems, a court order would allow an all-too-convenient electronic dragnet to fish the electronic waters for incriminating conversations.

Denning's final paragraph argues that Americans do not have the right to communications that the government cannot access. One might ask the same question about thoughts. Coercive use of sodium pentothal—or even torture—might be useful in the fight against crime. Thank goodness that citizens are protected against such intrusions.

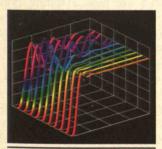
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A blurred image of Jupiter (left side), produced by the Hubble Space Telescope before its repair, was corrected with the MATLAB Image Processing Toolbox using an iterative restoration technique (right side). Data: Dr. S. J. Reeves, Auburn University.

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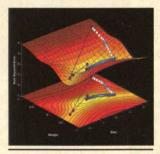
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While Dorothy Denning writes an interesting article, she misses the most obvious reason for rejecting all key escrow systems: serious criminals will not use them to protect their communications. Therefore Clipper and other key escrow systems will succeed only in using the taxpayers' money to compromise the privacy of common citizens and those criminals dumb enough to adopt the government's encryption system.

ERNEST HUA Mountain View, Calif.

At first, I thought Dorothy Denning's attempt to defend Clipper was clever and subtle satire. As I read on, I realized that the author was serious. She fails to realize that no one in their right mind would use a scheme involving escrowed keys when comparably secure and fully disclosed algorithms are available from nongovernmental sources. The notion that any government could effectively control the dissemination of alternative algorithms is a joke. The prohibition against exporting the Data Encryption Standard demonstrated that; only big-name software companies complied while thousands of shareware authors and small companies ignored the prohibition.

BRIAN JOHNSON San Francisco, Calif.

The author responds:

Clipper—at least its incorporation into the Capstone/Fortezza PC card—is not dead. With several companies now integrating the card into fax modems, ethernet adaptors, and applications packages as a security measure, I expect the Fortezza market to grow along with overall demand for commercial key escrow systems.

But critics make an important point when they argue that criminals will not use Clipper or other forms of key escrow encryption. As long as there are no laws in the United States controlling the sale and distribution of encryption products, the U.S. market will continue to be flooded with products that have no provisions for government access. This eventual threat to public safety and social order could be avoided by estab-

lishing a licensing program for encryption products that reasonably satisfy the government's decryption requirements and do not interoperate with unlicensed systems. While the manufacture and distribution of unlicensed encryption products would be illegal, no particular system would be mandatory and any licensed product could be used without restriction. Although such a licensing program would not prevent criminals from using unlicensed products, their availability would be limited to underground channels.

#### INDUSTRIAL USERS FORCE CHANGE

In "The Electricity Industry Sees the Light" (TR May/June 1995), Christopher Flavin and Nicholas Lenssen mislead readers with their arguments that the U.S. shift to a decentralized, competitive power system results from technological improvements in environmentally sensitive energy sources. While these factors may prove significant in the long run, the immediate impetus is the industrial users' desire to escape the consequences of the high embedded costs of their existing power suppliers.

In a previous era when economic indicators and regulators anticipated a world of scarce and costly fuel, utilities responded by investing in new nuclear, hydro, and coal facilities. With lead times of 10 to 15 years for major generating facilities, the error of the investment could not be foreseen. The elevated costs of these facilities resulted from several factors beyond the utilities' control, including ever-changing environmental and safety standards, high inflation and interest rates, and lengthy construction times.

Industries are now avoiding these costs by pursuing self-generation, negotiating with independent power suppliers, and promoting retail wheeling (in which a low-cost utility provides power to an industry located in the service area of a high-cost utility). This overall scenario is driven by financial considerations—not by technological advances, whether environmentally desirable or otherwise. Actually, extensive reliance on the unproven

Continued on page 78

## MIT Reporter

#### HERE A COMPUTER, THERE A COMPUTER

Mhen researchers at the MIT Media Laboratory talk about embedding a host of tiny computerized devices into everything from our eyeglasses to our jackets' shoulderpads, they aren't envisioning a silly world where people act like the 1960s sitcom spy Maxwell Smart, who had to remove his shoe to speak into its attached telephone. Instead, lab members speak of instruments that—complete with sensors, microphones, and speakers as well as computers that network with one another by radio transmission-will receive and deliver all sorts of information with almost no effort on our part. After all, says Michael J. Hawley, assistant professor of media technology at MIT, these instruments will be "nimbly

sprinkled" in useful locations. For example, those with speakers might be placed near our ears and those with mikes could be placed closer to our mouths. Other devices might be more sensibly placed

beyond our bodies.

Nicholas P. Negroponte, director of the Media Lab, has started a new effort to develop devices—both on our bodies and beyond them—that could be used for, say, alerting ambulance operators that a person needs medical attention or turning on heating or cooling systems when someone enters a room. The project, called "Things That Think" (TTT), will be formally unveiled this October when the lab announces up to 30 sponsors of a TTT consortium. Companies such as Interval Research Corp., Motorola, and AMP have signed on, as well as firms not traditionally involved in computers, such as Nike, Steelcase, and Lego. Since May the Media Lab has been talking with companies, including manufacturers of consumer items that might be logical sites for TTT devices. (How about a refrigerator that could sense when the milk has run out and will order more from the store? Or a chair



with computerized arm rests that, in response to, say, force from the occupants' arms, could be used to manipulate light and change the tempo of music coming from a CD?)

The notion of tiny computers embedded in the flotsam of our daily lives has been around for years, of course, starting with story lines in science-fiction novels. Today computers are in some devices, such as scanners at checkout counters, that we don't typically think of as computational instruments. And a small group of researchers is pursuing improvements on the basic concept, says Mark Weiser, a principal scientist at Xerox PARC in Palo Alto, Calif., who has been developing "ubiquitous-computing" devices for the office since 1988. The Media Lab could provide a meeting ground for disparate groups interested in the field—the lab is "very adept" at getting people to understand and "rally around" such concepts, says Greg Blonder, who has done related work as director of the Human-Centered Engineering Research Laboratory at AT&T Bell Laboratories in Murray Hill, N.J.

The Media Lab's work involves three

areas. Researchers will develop devices that combine computers with sensors to measure factors such as force as well as with signaling abilities to send that information elsewhere. Researchers will also work on ways for small armies of computers to communicate with each other, and on ideas that enable computers to use techniques related to common-sense thinking so that, among other attributes, the devices can detect human feelings and expressions.

Media Lab researchers combine all these attributes in scenarios that sound like modern tall tales. Start with a "body net" of TTT devices plus more strewn about your environs, and add the desire to take a trip. One morning, says Richard A. Bolt, a senior research scientist at the Media Lab and TTT's program manager, you could say out loud, in the comfort of your

kitchen, that you want to book a flight to Venice. Then your nearest computerized instrument-say, the one in your toaster-would carry out your command. Days later, when you're in the Piazza San Marco, your sunglasseswhich include an embedded computer with knowledge of your interest in architecture-would automatically focus on the renowned Doge's palace instead of on nearby pigeons. At this point, a device near your ear-such as one in your collar—would tell you when the palace was built, having gathered relevant information by, say, linking to external computer databases by satellite transmission. But if, while on vacation, you suddenly became more intrigued with the social scene—which your network could pick up from clues such as the places you'd visit or by your mentioning your change of heart to some part of your "net"your glasses would determine that you prefer to focus on the people around you.

If this sequence sounds farfetched, take note that Media Lab researchers have already wired a room that a person can walk into and say "show me a movie," whereupon the walls' electronic

#### MIT REPORTER

namic properties of materials." Some of

"ears" instruct lights to dim and a videotape to begin. Then there's the table over which people can wave their hands to manipulate drawings on a nearby computer screen. And consider the pair of computerized metal boxes that two people can place by their feet so that by shaking hands they exchange the data on their business cards (or, potentially, from lengthy documents). Demonstrating the latter device, Neil Gershenfeld, a physicist and assistant professor of media arts and sciences, explains that he has been scaling it down to place in vehicles such as shoes and wallets.

Gershenfeld, who heads studies on the sensing and signalling aspects of the Media Lab project, points out that to develop TTT devices researchers have to deal with physical limits "such as the electrical, mechanical, and thermody-

the instruments may have to detect such weak electrical signals, for instance, that researchers will have to devise new techniques to recover the signals from the strong background noise. Gershenfeld is also thinking about how to power the dozens of computerized devices a person might rely on. Batteries aren't reasonable given how many would need changing at any time. His group has been toying, he explains, with "parasitic power sources" such as light (think of solar calculators), wind, temperature, and mechanical energy from turning wrists and walking feet.

Hawley, meanwhile, is heading re-

Hawley, meanwhile, is heading research on setting up networks for devices that could be embedded almost anywhere. Since interference could sometimes make signaling among the devices within a single body net a problem, or crosstalk could occur as different people's nets get too close to one another, researchers will have to develop technologies and standards to restrict devices' attention to particular individuals, he says. Moreover, with only so much of the electromagnetic spectrum available for all forms of radio transmission. research is needed on innovative ways to use spectrum space.

The potential loss of privacy from interception of information is also an "awesome" concern, Hawley says. In part, devices will need appropriate encryption programs. Another privacy issue that researchers will have to overcome is the tracking of a person's general movements, points out Weiser of Xerox PARC. Encryption can't eliminate the possibility of hackers noticing that electronic information—albeit of an unknown type—is coming from a certain place, such as someone's office, and is moving in a particular direction. From this observers could deduce someone's path.

How to get one's computers to use techniques associated with commonsense thinking, in part to gather information about human feelings, is the TTT realm headed by Tod Machover, associate professor of music and media. How about a device, he proposes, that, perhaps by recognizing how a user grasped it on his or her way out the door, could determine if the person was under stress? That object or a networked one could then, for example, caution the person to drive carefully and suggest a particular round of relaxation exercises.

Not all these devices will be built immediately, of course. But that doesn't stop Blonder of Bell Labs from considering the kinds of practical questions that could arise once companies think about actually manufacturing clothing and the like with tiny, embedded computers. For instance, how many such products will individuals need? Problems could crop up if your pair of "computer" shoes is black, but some days you want to wear your brown shoes. And how will people keep up with maintenance and upgrades if they own dozens of devices? Society may also need to ensure that any devices that can offer critical uses such as medical assistance are universally available.

Thomas G. Zimmerman—a research staff member at IBM Almaden Research Center in San Jose who, while a graduate student in Gershenfeld's lab, helped develop the device that can be used to exchange business cards—notes that while some possible uses for tiny computerized devices may seem silly, there's no way to foresee how society will employ the technology. Products of great worth should result, he says: "You have to allow room for serendipity and the unexpected."—LAURA VAN DAM

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## OF STICKY CHEMICALS, DNA, AND CANCER PREVENTION

Can't live with it, can't live without it. That's what researchers have been finding about a natural bodily process, called methylation, in which organic chemicals called methyl groups adhere to cells' DNA in certain places. Peter Laird and Laurie Jackson-Grusby, postdoctoral fellows in molecular biol-

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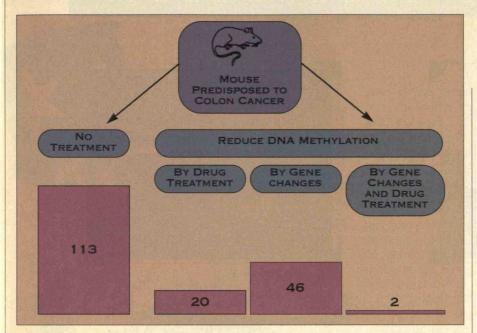
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#### MIT REPORTER



ogy at the MIT-affiliated Whitehead Institute for Biomedical Research, have shown that a reduction in methylation can prevent the formation of potentially cancerous polyps.

But safely inhibiting methylation might be tricky: when there is too little of that process, cells die. And that can sometimes cause severe problems. For example, dying cells in the gastrointestinal tract can lead to debilitating nausea, diarrhea, and the inability to digest food. While these conditions can be tolerated for short bursts during chemotherapy, they could not be endured throughout long-term preventive treatment.

Laird and Jackson-Grusby, who head up a team of scientists in the laboratory of Rudolf Jaenisch, a Whitehead researcher and professor of biology at MIT, actually began their research anticipating an entirely different finding than the idea that methylation reduction blocks tumors. Because earlier work showed that cells undergo a drop in methylation on their way to becoming malignant tumors, the scientists decided to study whether reduced methylation causes tumors to grow in mice with genetic defects predisposing them to colon cancer. They chose that cancer type partly because these mice develop easy-to-spot polyps. And they are abundant; hundreds of colon polyps normally sprout during the first six months of life.

When the researchers checked the animals after 50 days, however, they didn't

find what they expected—the mice had relatively tumor-free colons. Laird and Jackson-Grusby therefore prolonged the study 50 days. Still they found no tumors. Finally, after 180 days, the scientists again compared the methylation-reduced mice to a control group with normal levels of methylation. "The outcome was very dramatic," Laird says. In the first group an average of 46 polyps formed per mouse, compared with an average of 113 polyps in each untreated mouse. In another, similar study, they found even fewer polyps per treated mouse—just 2.

#### Suppressing Tumor Growth

The scientists had to square their findings with the previous research linking methylation loss with tumor formation. They have proposed, therefore, that while cells on their way to becoming cancerous exhibit an overall drop in methylation, the process could actually become more active in some DNA regions that contain genes whose products—"tumor suppressor" proteins—inhibit cell division. When the manufacture of these proteins is blocked, a nascent cancer cell divides uncontrollably.

Since in all forms of cancer, tumor-suppressor genes are among the first genes to be disrupted as a cell becomes cancerous, Laird and Jackson-Grusby's hypothesis implicates methylation in a variety of cancers other than that of the colon. By six months, mice predisposed to colon cancer sprout an average of 113 polyps, 1 percent of which progress to cancer. Using drugs, gene changes, and a combination of the two in order to inhibit a natural process called methylation, researchers cut the polyp rate.

The same is true for a second explanation the researchers have come up with for how a loss of methylation could prevent tumors from growing. A dramatic methylation drop might prevent mutations that direct a previously normal cell to grow uncontrollably and become cancerous. Scientists have separately found that methylation sometimes causes cytosine, one of DNA's four basic chemicals, to mutate into thymine, another basic DNA chemical. Close to half of all mutations found in the DNA of cancerous colon cells are of this type, and this form of mutation also crops up frequently in other types of tumor cells.

Stephen Baylen, a cancer biologist at Johns Hopkins Medical School, also notes that methylation levels shift during the progression of most, if not all, cancerous tumors, including those of the prostate and breast. This adds weight to the suspicion that methylation changes could affect a wide range of cancers.

Given that possibility, the Whitehead researchers are now testing other strains of mice to see if a reduction in methylation prevents the development of tumors other than those of the colon. If that proves to be the case, scientists might then try to devise a methylation-inhibiting drug for people with genes predisposing them to certain kinds of cancer. But that task would not be easy, Laird cautions. First, the compound he and his colleague are using to help lower methylation in mice is toxic—used so far only in clinical trials as a chemotherapy agent to treat people who will otherwise die of leukemia. Whether researchers could come up with a safer compound for long-term, preventive use is unknown. Also, scientists would need to find a way to target such a drug to a specific area and thus maintain methylation levels elsewhere in the body.—LIZ LEMPERT

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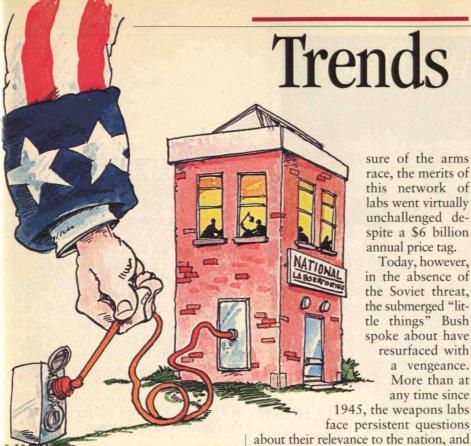
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## The National Labs **Unplugged?**

During and after World War II, the formation of the U.S. network of national laboratories was marked by surprisingly little acrimony or debate. As Vannevar Bush, science adviser to Presidents Roosevelt and Truman, recalled in his memoirs, a sense of national purpose and national emergency propelled the military research program from the start. Comparing the issues of contracts, salaries, and the organization of the emerging labs to the lives people were risking during World War II, Bush explained that "little things become submerged when great things are dominant."

Bush's assertion held throughout the days of Sputnik and the "missile gap" as some 50,000 people in the United States—including some 19,000 scientists and engineers—toiled along the Cold War's technological front at the nine major federal laboratories. Under the aegis of the nuclear weapons program, national lab researchers and staff helped to develop everything from precision guidance systems and spy satellites to spinoffs such as Teflon and microwave ovens. And with the unremitting pres-

sure of the arms race, the merits of this network of labs went virtually unchallenged despite a \$6 billion annual price tag.

Today, however, in the absence of the Soviet threat, the submerged "little things" Bush spoke about have resurfaced with a vengeance. More than at any time since 1945, the weapons labs

about their relevance to the nation, and a budget-cutting Congress has made the national laboratories one of its targets. One piece of recently introduced legislation calls for abolishing not only all the labs, but their parent agency the Department of Energy as well. Former Energy Secretary Donald Hodel, who served in the Reagan administration, has endorsed the bill, put forward by first-term Representative Todd Tiahrt (R-Kan.), calling it "a breath of fresh air for Washington politics."

Despite Hodel's support, close watchers on Capitol Hill say Tiahrt's bill has little chance of passage this year. But the sentiment behind it—that major changes are needed in the national laboratory system—is widely held. Earlier this year, a national task force led by Robert Galvin, chairman of Motorola, completed the first major examination of the labs since the end of the Cold War. The so-called Galvin report lambasted "increasing overhead, poor morale, and gross inefficiencies" in the federal laboratory system. Little wonder, with these kinds of frontal attacks, that Albert Narath, president of the New Mexico-based Sandia Laboratory has called the past several months "the most uncertain, difficult time that I can remember in recent years."

As the lack of a superpower arms race

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left the labs searching for a compelling mission, the White House under George Bush tried to address the situation by declaring war on declining U.S. industrial competitiveness—a strategy eagerly embraced by the current administration. The national labs have since initiated offensives against everything from breast cancer to global warming. Unfortunately, though, none of these efforts have entailed the overarching sense of importance or the public support afforded to competing militarily with the Soviet Union.

Instead, today's national laboratories are largely home to a hodgepodge of more than 1,000 Cooperative Research and Development Agreements, or CRADAs, in which researchers at the labs share their expertise with U.S. corporations on topics ranging from robotics to toxicology. The roster of companies involved in these specialized research collaborations reads like a list of the Fortune 500, including AT&T, IBM, Dow Chemical, Goodyear, and Procter & Gamble, to name just a few. But many observers, including the Galvin committee, have criticized the CRADA system at the national labs as unfocused. The report asserts that "industrial competitiveness, broadly defined, has no place as a stand-alone mission of the laboratories." Citing the labs' longstanding specialized mission and high level of secrecy, the report adds, "the idea that the laboratories are, or could become, cornucopias of relevant technology for a broad range of industries is a myth."

#### **Technological Powerhouses**

So what should be done? Despite Tiahrt's proposal, most decision makers are loath to walk away from the labs, given their wealth of talent and tangible assets. Not only are tens of thousands of scientists and engineers still employed by the labs, but they also house a powerful scientific infrastructure, including a useful inventory of exotic equipment from particle accelerators to huge lasers.

Perhaps more important, almost everyone recognizes the need for part of the

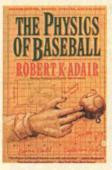
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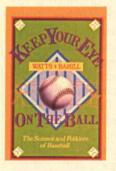
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Department of Energy's "nuclear stockpile stewardship and management program" that safeguards the nearly 15,000 remaining nuclear weapons it has built. "We have not given up our nuclear capability," says DOE representative Phillip Keife, "and we have to maintain the weapons we've got. Plus we are still playing an important role in dismantling nuclear weapons here and in Russia." As one congressional staffer explains, a robust stewardship program is more costly than it first appears because the highly specialized technical knowledge requires supporting a sizable community of experts. Nonetheless, most concede that these efforts could be accomplished at a fraction of the cost and personnel of the current laboratory system.

#### In Search of a Mission

Meanwhile, the Galvin committee leveled some of its strongest criticisms at DOE's management of the labs, which they called "broken" and in need of replacement by "a bold alternative." In place of the department, the Galvin committee recommended that the labs be overseen by a new nonprofit, "quasi-governmental" R&D board, with members appointed to several-year staggered posts to insulate them from day-to-day Washington politics.

But outside observers still ask the broader question of precisely what research the labs should be undertaking, no matter what their structure. "Collectively, they desperately need a mission," says Stuart W. Leslie, historian at Johns Hopkins University and author of *The Cold War and American Science*. Rather than just becoming hired guns for corporations, agrees Daniel Kevles, historian of science at Caltech, the "labs ought to have some overarching goal that is related to the national purpose."

Along these lines, one proposal by M. Granger Morgan of Carnegie Mellon University and Robert M. White, president emeritus of the National Academy of Engineering, calls for each laboratory to adopt one key technological area as its focus, such as communications, energy,

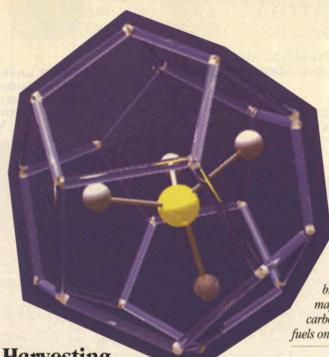
aerospace, or biotechnology, that is deemed critical to the nation's economic strength (see "A Strategy for the National Labs," TR February/March 1994, page 69). Most of the envisioned work at the national laboratories should be basic research, they say. But "it should be motivated by and related to significant problems in the area of each laboratory's technology mission." Instead of proprietary CRADA agreements with individual corporations, Morgan and White propose an open, peer-reviewed system, where inhouse staff collaborate with doctoral students and visiting industry scientists and everyone publishes in the open literature.

As provocative as it sounds, Morgan and White's proposal faces an uphill political battle in Congress where the current climate makes it difficult to advance any broad new program that will cost federal dollars. And while these separate incubators of particular technologies could be a powerful tool, they show little promise of capturing the public imagination the way, for instance, the Apollo program's race to the moon did. Perhaps most surprising of all, plans like Morgan and White's are not even widely embraced by managers and staff at the national laboratories themselves.

For instance, talk of the need for a new overarching mission irks Sandia's Narath, who calls it a public misperception. "We still have a weapons mission," he maintains. "We still have an energy mission. We still have an environmental mission. We still have a mission to make contributions to basic science in areas that provide the underpinnings for our applied work. None of that has changed." But Narath's comments may underestimate the level of dissatisfaction in many quarters and the resulting pressures for change.

In Congress this session, it appears that the status quo will reign but, absent strong leadership to make a compelling case for the labs, many worry that Rep. Tiahrt's lowbrow comparison may take root. "Like disco dancing, pet rocks, and mood rings," Tiahrt says, the national labs' "time has come and gone."

—SETH SHULMAN



TRENDS

Subjected to the extreme pressures and freezing temperatures at the bottom of the sea, methane gas excreted by tiny bacteria becomes trapped inside cage-like icv molecules. Accumulated over eons, buge deposits of these natural gas bydrates now buried in the ocean floor may bold twice as much carbon as all other fossil fuels on earth combined.

Harvesting
Natural Gas from
the Ocean Floor

Through the steady, silent industry of countless bacteria digesting the ocean's organic debris, a surprising stash of methane gas has been deposited beneath the sea—trapped in icelike crystals in floor sediments.

To the eye, the deposits may look like nodules or veins of ice glistening on the murky ocean bottom. But this odd quarry, discovered only two decades ago, is now the object of a great geological quest, for some scientists think the microscopic methane molecules locked inside could eventually provide salvation for energy-hungry societies around the globe. These methane deposits "may hold twice as much carbon as all the other fossil fuels on earth—coal, oil, and existing sources of natural gas-combined," says William Dillon, a geologist with the U.S. Geological Survey in Woods Hole, Mass. Thus, "they may represent huge energy sources for the future."

The so-called methane hydrates form when the methane gas—excreted by sea bacteria that primarily consume phytoplankton as well as the flesh of assorted dead organisms—dissolves and forms into crystals in the icy cold waters and tremendous pressures at the bottom of the sea. This process, which has probably continued for millions of years, has

left huge deposits of the natural gas. In fact, one pocket alone, a 30-mile-by-100 mile area called the Blake Ridge off the North Carolina coast, holds enough gas to supply all the needs of the United States for 100 years, estimates Dillon.

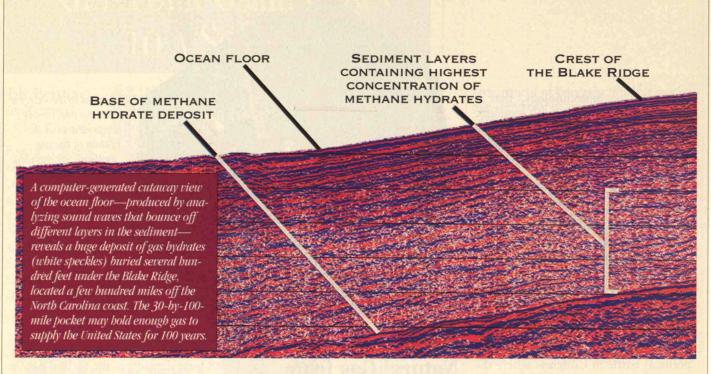
Chemists first mused in the 1930s about the possible existence of an odd state of matter in which high pressure could cause water to crystallize around a gas. But they dismissed that prescient thought as nothing more than a fanciful theoretical exercise.

Then in the spring of 1970 during a scientific expedition to study the sea floor, ocean geologists were puzzled by the bizarre, fizzing icy sedimentary cores they retrieved. "They had no idea what was happening," Dillon says. "The cores constantly bubbled and bubbled for hours."

Other researchers noticed a correlation between the site of the fizzing core and anomalies on sonar maps of the ocean floor that had been made to study sea-floor geology and tectonics. The sound waves, which travel at different speeds through different materials, accelerated as they passed through the icy deposits within the surrounding denser sedimentary rock.

Using sonar to locate more such deposits, researchers have found massive concentrations along the East Coast of the United States, typically in the relatively shallow waters of the continental shelf, says Charles Paull, a marine geolo-





gist at the University of North Carolina. Hydrates have also been discovered off the coasts of California, Washington, and Alaska. In fact, the coastal waters of the north slope of Alaska alone hold an estimated 44 trillion tons of methane hydrates—more than a two-year supply for the United States' needs. Since deposits have usually been discovered serendipitously during ocean floor-mapping expeditions, scientists believe many other hydrates surely must exist.

In a major step toward one day realizing this potential energy bounty, a 16-nation team of scientists will sail down the Atlantic coast of North America in November and December to retrieve samples of the hydrates from the deep. The eight-week journey should help researchers interpret future sonar mapping data more accurately and yield better estimates about whether recovery efforts would be economical.

The researchers will drill a succession of holes in the sea floor and extend thin pipes through which they will lower equipment for sending sound waves through the rock and hydrate deposits. This will enable them to better assess hydrate deposit sizes, Paull explains, since the waves can be studied before they become distorted as they reflect back through the water to the surface. The sonar tests can then be correlated with surface sonar mapping to better

interpret those images and analyze future sonar images.

The researchers will also use a special chamber that returns samples to the surface under the same intense pressures that exist on the ocean floor. The team will study the hydrates' molecular structure and look for clues about how the methane gas might be harvested. For instance, one approach is to melt the deposits so the gas can be vented to the surface, says Gerald Holder, a chemical engineer at the University of Pittsburgh. Using traditional gas or oil drilling techniques, concentric pipes could be placed on the ocean bottom. Then warm water, perhaps surface waters, could circulate down through one pipe to melt the crystals, while the released gas could travel through the other pipe to the surface.

But such an approach would have to be refined, says Rodney Malone, a geologist at the U.S. Department of Energy and former manager of the agency's methane hydrate research program, which was ended in 1993 because administrators decided that hydrate use could be decades away. For example, questions remain about how easily the crystals would melt and whether the energy spent would be excessive for the amount of methane returned.

There is also a risk that the melting crystals might destabilize a region of the ocean floor, Holder says, turning it into

a slurry of mud that could damage the pipe rigging. Companies may also be reluctant to invest the many tens of millions of dollars required for such special drilling equipment, he adds. While most ocean oil rigs can drill to depths of about 500 feet, hydrate rigs must be able to reach deposits often found at depths of one-half mile or more.

Other economic factors may also play a role in hydrate development. For now, abundant, untapped deposits of methane are accessible on land and in ocean rock, Malone says. There is no immediate need to take the risk.

Even so, Japan is moving forward with methane hydrate research. Besides sending a team on the Atlantic coast expedition this fall, the Japanese government has planned a demonstration project of hydrate harvesting by 1999 in the Nankai Trough off the east coast of Japan's main island.

And in the United States, Holder says, improved assessments of hydrate abundance and geological stability expected from the upcoming expedition could influence companies' willingness to fund further research and development. Moreover, as Paull points out, "we can no longer ignore these deposits as curious phase transitions. In the future, we're going to be hunting harder for less easily accessible amounts of fossil fuels."

—DAVID GRAHAM

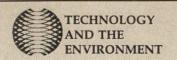
### Data in Venice: Saving Outdoor Art

When it comes to preserving cultural heritage, few cities face a more daunting task than Venice. With limited conservation funds inevitably devoted to landmarks like St. Mark's Cathedral or the Bridge of Sighs, thousands of pieces of public art that are an integral part of the city's Renaissance legacy are all but overlooked.

Now a Venetian computer scientist has taken preservation matters into his own hands by creating what may be the world's first computerized catalog of public art. With its automatic means of determining which pieces to conserve first and at what cost, the system may profoundly influence how cities go about preserving their statues, sculptures, and other outdoor artwork.

It all began when Fabio Carrera returned to his native city after studying computer science at the Worcester Polytechnic Institute in Worcester, Mass., and attended an exhibit on outdoor Venetian art. Sponsored by the Archeoclub d'Italia, a national conservation group, the exhibit showcased photographs of some of the most endangered of the city's more than 3,000 pieces of public art. Hanging on the walls of buildings high over canals or down narrow alleyways, this so-called "erratic art" dates mostly from Venice's Golden Age in the fifteenth century and includes coats of arms, high- and lowrelief sculptures, tabernacles, and Leone Marciano, the St. Mark's lion that is the symbol of Venice. The exhibit stressed how these pieces, which in some cases have survived since the time of Marco Polo, were now being lost to posterity because of weathering, pollution, neglect, and rampant theft.

To address this problem, Carrera started by creating two computer databases. In the first, he entered complete descriptions of each piece of outdoor art, including type, location, dimensions, material, and any bibliographical references to the piece in the historical litera-



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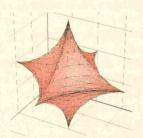
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ture. In the second, he added information on the condition of each piece, details he has been painstakingly collecting since 1991 with the help of Worcester Polytechnic students and volunteers from Earthwatch, a scientific field-research organization based in Watertown, Mass.

Carrera then wrote several customized programs that would combine information from the two databases and calculate the urgency and cost of conservation. The program ranks each piece in a conservation index based on the "weights" given to each of several physi-

cal factors—cracks, for instance, received a higher rating than grime. Another algorithm determines the priority for conserving each piece by combining the conservation index with the piece's age, rarity, danger of falling or being stolen, and whether or not it had artistic, historical, or popular significance. A third program uses the basic costs associated with any restorationan architect's fee to assess the restoration needed, city taxes, and the price of the actual restoration—to come up with an estimate.

In the end, Carrera found that four of five pieces could be repaired at a cost of less than 9 million lire each (about \$5,500), and that the entire collection could be returned to a semblance of its original glory for a grand total of about 11.5 billion lire, or \$6.7 million.

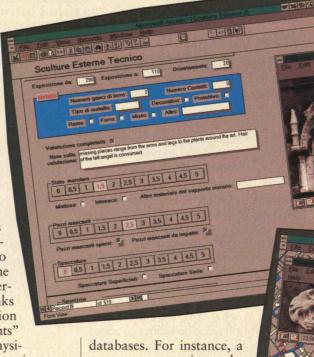
#### The Power of Data

In an effort to make the system more useful to historians, architects, and conservators, Carrera gathered up all the data he had carefully stored and ushered them into a Geographical Information System. The GIS allows interested professionals to visually compare and contrast any information within the two conservator can instantly create a thematic map of all fifteenth-century art that includes symbols for each type of object, such as coats-of-arms. The symbols can assume different colors depending on the urgency of restoration; red shields, for example, may represent coats of arms needing urgent attention, while green circles may

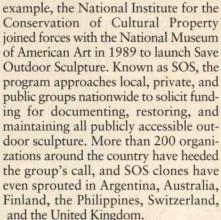
flag those in good condition. Photographs of each object, which Carrera's crews shot on location and downloaded to a separate database, can also be called

up on the screen.

The most important benefit of the system, Carrera says, is its ability to help Venetians become active in preserving their cultural heritage. For example, armed with his data, Carrera has approached specific individuals and groups for support, such as the gondoliers he hopes will fund restoration of a top conservation priority, a sculpture dubbed the Madonna of the Gondoliers. The system also guided him in instituting a neighborhood collection-box system. "We're talking about only \$3,000 to \$5,000 to restore each piece, which is

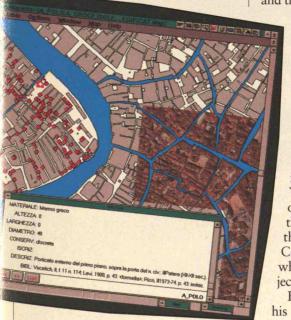


To identify which of Venice's outdoor artworks are in greatest need of restoration, a novel database ranks each piece—such as this Madonna with Child (left)—according to its exposure to the elements, condition of wall, materials, missing pieces, and cracks. A second program (below) depicts all the public art in a given area (red squares) and allows users to select pieces, such as this twelfth-century roundel, and determine their material, size, condition, inscription, location, and biblical reference.



To make Carrera's system more effective, Marchesi suggests that he expand the survey to include information on why each artifact is in the shape it is in, which will shed more light on exactly what has to be done to remedy matters. The city's superintendent of monuments has offered to teach Carrera's field workers how to gather such information. Meanwhile, the New York-based Save Venice, Inc., one of roughly 20 committees around the world dedicated to preserving the City of Canals, approached Carrera last year about choosing which public-art conservation projects to support.

Emboldened by the early success of his efforts to promote conservation awareness, Carrera is about to launch the Venetian Committee for the Preservation of Public Art. The committee's first projects will include producing a CD-ROM based on Carrera's system as well as a series of guidebooks and postcards, sales of which will help fund restoration projects. "In the end," Carrera wrote in the proceedings of a 1993 UNESCO conference on restoration, the foremost goal of this effort is to preserve the external art of Venice for posterity, "to ensure that these small yet significant details will continue to adorn the streets and canals, maintaining that intangible aura of mystery that makes every turn a pleasant and unexpected surprise and a visible testimony of the past."—PETER TYSON



well within reach of collection boxes," he says. The boxes will also encourage people living nearby to "pay more attention to the art they see every day and help to make these works a source of pride for the community." He finds it appropriate "that a project on public art should result in a product that is itself ultimately accessible to the public."

Carrera's system has already drawn support from the Venice branch of the United Nations Educational, Scientific, and Cultural Organization (UNESCO). According to Irina Ivancich Marchesi, head of Venice's UNESCO office, the system could easily be used by similar organizations. In the United States, for

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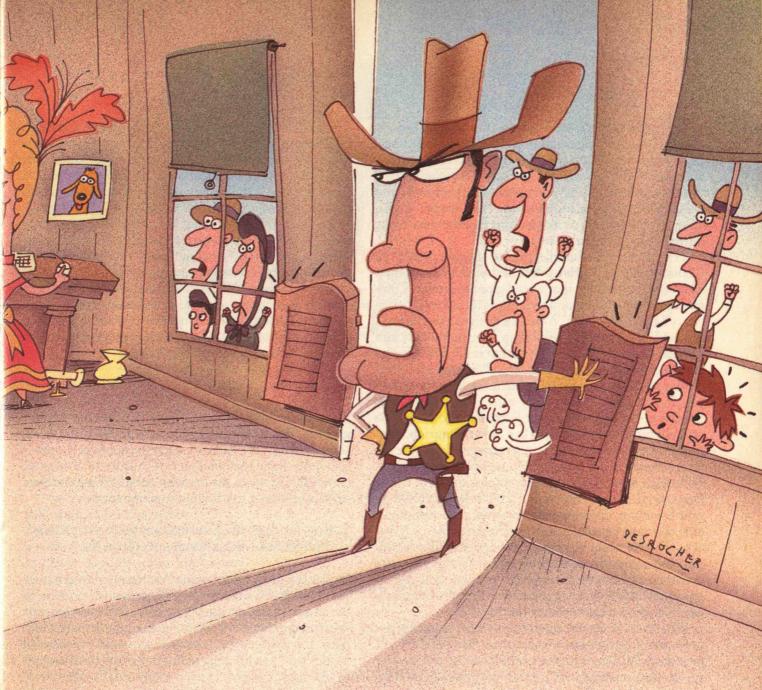
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# Law and Comes to Cyk

At the electronic frontier of computer networks, rules and regumented into cyberspace, the new medium must accommodate the so



## Order Prepace

ns have been few. But as millions of settlers mes ill-suited legal restraints of civilization.

BY EDWIN DIAMOND AND STEPHEN BATES yberenthusiasts sing the praises of the body electric, a global realm of freewheeling computer networks where speech is open and no restrictive rules apply. But because the Internet ("the Net") exists within societies that have long-standing traditions and laws, its rapid assimilation into the "real world" is provoking tensions and confrontations that are now being

played out in the legal domain.

This spring, for example, the U.S. Senate passed the Communications Decency Act, authored by Sen. James Exon (D-Nebr.), a bill that would give the Federal Communications Commission the power to regulate "indecency" on the Internet. A number of state legislatures are considering similar legislation. Net enthusiasts and systems operators argue that the Exon bill and proposals like it are unconstitutional as well as unworkable: if a literary magazine put its contents online, for example, and included a short story with a four-letter word, the law could leave the editor liable for a \$50,000 fine and six months in jail. Speaker Newt Gingrich, professed cyberspace enthusiast, also opposes Exon; the bill is now awaiting action in the House of Representatives. Following the Oklahoma City explosion, Sen. Diane Feinstein (D-Calif.) introduced a bill to crack down on bomb-making guides on the Internet, an understandable, if somewhat emotional, reaction to domestic terror acts. The Feinstein bill passed the Senate and is awaiting House consideration. Meanwhile, several states are considering bills to criminalize "online stalking"repeatedly making cybercontact with an unwilling subject. Connecticut has enacted one into law.

Whatever the fate of these regulations, in the legislatures and in the courts, the concerns they reflect won't go away. Battles over the boundaries of online free speech have erupted with increasing frequency over the past year or so, as the Internet has grown in population and in public awareness. The Net is a breeding ground for all kinds of expression, some of it lyrical and wise, but some of it vile and hateful, all of it easily accessible to anyone who logs on. Because freedom of expression is generally contested only when the speech is repugnant, the cases that have arisen tend to focus on the seamier side of the Net.

Indeed, a major factor driving such legislation is the

EDWIN DIAMOND is a journalist and director of the News Study Group at New York University. STEPHEN BATES, a writer and lawyer, is a senior fellow at the Annenberg Washington Program in Communications Policy Studies, a nonpartisan think tank. They are the authors of, among other books, The Spot: The Rise of Political Advertising on Television (MIT Press, 3d ed., 1992). Individually or jointly, they have written about the Internet for American Heritage, the New York Times, the Wall Street Journal, The Hill, and other publications. Peter Hyman and Julie Ziegler, members of the News Study Group, provided research help for this article.

prevalence of pornography in cyberspace. A Carnegie Mellon study found 68 commercial "adult" computer bulletin board systems (BBSs) located in 32 states with a repertory of, in the researchers' dry words, "450,620 pornographic images, animations, and text files which had been downloaded by consumers 6,432,297 times." Concerned by these findings and attempting to comply with Pennsylvania's obscenity laws, the university banished many Internet "newsgroups" that offered sexually explicit photographic images, movie clips, sounds, stories, and discussions, noting that Pittsburgh-area high schools had access to these newsgroups through the Carnegie Mellon system. Under fire for censorship, the university restored the text-only sex newsgroups, but not the ones carrying photographic images.

#### FIVE DIFFICULT ISSUES

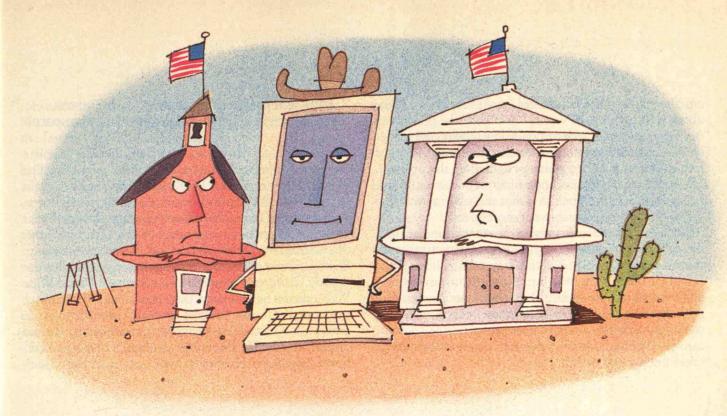
The Net has thus become a First Amendment battle-ground. The resolution of the ensuing legal battles—some of which are likely to reach the Supreme Court—will help shape the conduct and culture of computer communications in the decades ahead. These conflicts revolve around a few fundamental questions.

## 1. How far does the Constitution go in protecting repugnant or defamatory speech on the Net?

Earlier this year, University of Michigan undergraduate Jake Baker was arrested by FBI agents for posting to the alt.sex.stories newsgroup a violent narrative of rape and torture that used the real name of a female classmate for the victim. Baker subsequently e-mailed a friend that "just thinking about it [his fantasies] doesn't do the trick anymore. I need to do it." The university suspended him and a federal judge ordered him held without bail, charged with the federal crime of "transporting threatening material" across state lines.

Some civil liberties groups rushed to the student's defense, arguing that the Constitution guarantees freedom even for repugnant fantasies broadcast worldwide. In June, a federal judge in Detroit implicitly agreed, throwing out the case. While the university acted properly in disciplining the student for his behavior, the judge ruled, there was no cause for a criminal indictment.

The press critic A. J. Liebling once observed, "Freedom of the press is guaranteed only to those who own one." On the Internet, for better or worse, everybody "owns" a press. Baker did not have to send his grotesque tale to a series of kinky magazines until one finally accepted it for publication; he, like any other Internet user, could simply upload his word-processed file to alt.sex.stories, where no editor checks for spelling



or grammar, let alone merit.

The young woman could still bring civil action against Baker for libel. When Penthouse published a piece of short fiction about the sexual adventures of a "Miss Wyoming" a few years ago, the real Miss Wyoming sued. Her case was thrown out because the piece was unambiguously fictional, but a Baker-like case, where the writer knows the subject, might reach a jury.

The Jake Bakers of the world, and their supporters, could also be stopped by gatekeepers, aka censors. Although Net boosters extol the new medium for provid-

ing the freest speech the world has ever known, more and more monitors have been showing up, like hall patrols in a rowdy high school. For example, some online services screen messages sent to public chat areas, often using software that scans for comedian George Carlin's seven dirty words. The moderators of some mailing lists and Usenet groups exclude materials that they deem inappropriate. And some exclusions can be downright aggressive: renegade users have created software agents—"cancelbots"—that delete other users'

of expression is generally contested only when the speech is repugnant, the cases that have arisen tend to focus on the seamier side of the Net.

public Usenet messages by forging a cancel command that seems to originate with the author of the original message.

But when public officials try to restrict information, such as in public schools, state universities, or government offices, they are potentially infringing on the First Amendment. We therefore foresee the day when a court might well order a state university to restore students' access to the alt.sex hierarchy. Restrictions of online speech, including hate speech, would also be subject to protection under the Constitution. In the past, the courts

have established a "public forum doctrine" guaranteeing the right to speak in public parks and streets; some states have extended the doctrine to cover large private gathering places, such as shopping malls. Some courts will no doubt rule that the idea of a public forum applies to privately owned computer bulletin boards as well.

Litigation isn't the only way to resolve conflicts over free speech on computer networks. America Online general counsel Ellen Kirsch recently lit a small candle of good sense in the gathering cyber gloom. A lawyer from

a major midwestern firm complained to America Online about postings that, he wrote, "defamed" the product of one of his clients. Kirsch responded by sending the lawyer an AOL starter kit with three hours of free time and urged him to put up his own postings defending the product. Her move was in the tradition of Supreme Court Justice Louis Brandeis, who believed that the solution to "bad speech" was not censorship but more speech.

Yet system operators may still be caught in the middle. If the sysop allows a user to post defamatory statements, for instance, the victim may sue for libel; if the operator deletes the posting, the author may sue for abridgment of free speech. Network operators, along with their attorneys and, ultimately, judges, will have to decide such issues case by case; the process of demarcating the boundaries of free speech online will therefore undoubtedly take years.

## 2. Laws and mores differ among towns, states, and countries. Whose rules apply in cyberspace?

Say that a New York City user downloads a favorite Sherlock Holmes story from a London computer. The works of Arthur Conan Doyle are in the public domain in the United Kingdom but some are still under copyright in the United States. Which country's law prevails? Or what happens if a member of the California bar offers to answer legal questions on a Usenet newsgroup. Is the attorney guilty of practicing law without a license outside California? *Penthouse* has created a World Wide Web edition whose first page instructs: "If you are accessing Penthouse Internet from any country or locale where adult material is specifically prohibited by law, go no further." Is that disclaimer enough? Or would Penthouse executives be wise to avoid any travel to a puri-



## Filtering the Net

By Ellen Spertus

NFETTERED by censorship, the Internet is both a rich marketplace of ideas and an arena for obnoxious behavior. People who express unpopular opinions receive harassing and even threatening e-mail. Parents are reluctant to allow Internet access from the home for fear of sexually explicit material that their children might encounter. Many women have found that letting their e-mail address out on the Internet is interpreted as an invitation to indecent e-mail from strangers. This disturbing wildness has led some to argue the need for new laws restricting speech online.

But the rush to legislate and regulate ignores the growing availability of easy-to-use tools that can shield people from speech they wish to avoid, without limiting what others can communicate to willing readers. As technologies for filtering online discourse become more common, laws that cramp freedom of speech online will seem less necessary.

Many of the programs that allow users to read messages posted on the Net's thousands of Usenet bulletin boards, for example, provide the option of a "kill file," which automatically bypasses messages that are posted by particular individuals or whose subject lines or body include certain words. Since the for offensive material
can make the Internet
a more hospitable
neighborhood—and no
new laws are required.

kill file affects only the person who sets it up, nobody ends up censoring anybody else's reading material.

Similar tools, available for free on the Internet, can scan incoming e-mail. Such filtering tools can be easily set by the user to, for example, label as not worth reading any message containing certain offensive pieces of text. This software could be quite flexible, perhaps allowing the user to apply stricter

restrictions to mail sent by strangers than by acquaintances. The word "damn," for example, might be cause for alert in a post from a stranger but totally appropriate in a message from a Bible discussion mailing list.

A useful filter must do more than simply search for telltale words. At Microsoft, I am investigating verbal patterns that tend to be insulting; for example, "you" modified by a noun phrase is much more likely to be an insult ("you stupid idiot") than a compliment ("you good person"). Also, imperative statements—usually without an explicit subject commonly signal flames; consider "drop dead," "get a clue," and various obscene expressions. Software being developed could be set up by the user to flag or block delivery of messages in which such sentence constructions occur. Of course, no such filter is perfect. It will have to cope with the poor grammar, punctuation, and spelling common in e-mail; a message like, "What on earth is a BIGGOT like you doing walking on the face of earth?" would evade a filter that didn't recognize the misspelling of the epithet "bigot." And as we develop tools to recognize classes of messages as flames, writers will develop verbal techniques and circumlocutions that evade such software screens.

tanical country where they might face prosecution? Such questions will pop up with increasing frequency as the Internet becomes more popular.

Because it spans the globe, the Net can subvert attempts by governments to restrict the flow of information. Ontario officials, for example, forbade publication of information about a particularly sensational murder case in an attempt to avoid an O.J. Simpson-like circus of publicity. The gag order did restrain mainstream media outlets but was swept away on the Internet when someone created a Usenet group called alt.fan.karla.homolka (the name of one of the defendants). After users began posting news and rumors concerning the case, officials ordered Canadian systems operators to delete the group from their storage disks. The operators complied—but some Canadians found they could easily use the Internet to reach the news-

group from servers in the United States, Japan, or elsewhere.

The Homolka newsgroup isn't alone in evading national laws. According to reports in Ontario newspapers, the leader of a Canadian group that claims the Holocaust never happened plans to promote his views on the Net. The Canadian, Ernst Zundel, supposedly will use an Internet access provider based in the United States in hopes of avoiding prosecution under Canadian laws against hate mongering (on the Net, he'll find others of his ilk on the thriving newsgroup called alt.revisionism).

One need not even leave the United States to encounter a broad range of standards on acceptable forms of expression. Consider the saga of Robert and Carleen Thomas, a married couple in their late 30s living in California's Silicon Valley. Until four years ago,

#### THE WORD-OF-MOUTH SOLUTION

To cope with such limitations, and to avoid the requirement that each networked citizen work alone to fight flames, members of online society could pool information on the quality and tastefulness of various regions of the Net. The experimental Tapestry system at Xerox's Palo Alto Research Center, for example, allows users to rate each Usenet posting and each piece of incoming bulk e-mail by clicking on "Like It" or "Hate It." Everyone else using Tapestry can then instruct their e-mail software to identify messages liked by a specified number of people or by a particular individual whose opinion they value. The MIT Media Lab's Webhound project similarly invites surfers of the World Wide Web to give a numerical rating to each Web page viewed; in a kind of turbocharged word-ofmouth system, Webhound will then point you to some of the favorite pages of people whose tastes resemble your own. Webhound is available for free on the Web, at:

http://rg.media.mit.edu/projects/webhound/

It doesn't take fancy new software for groups of people to share recommendations. An online newcomer to the Net can simply make a copy of the Usenet kill file that a trusted Net veteran has compiled.

Taking this a step further, a user could merge several people's kill files, blacklisting only those Usenet posters whose name appeared on more than one. (Developing easy-to-use software to perform such comparisons would be a small project for any software company.)

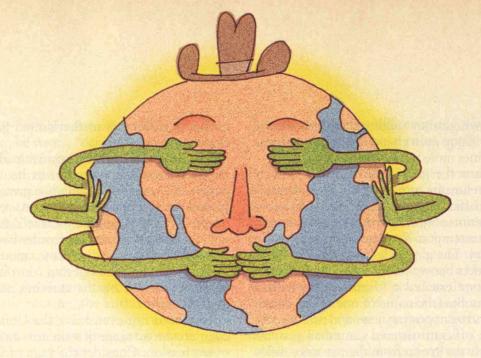
Software developers could devise similar reputation-based systems for e-mail. If I get a message that I consider offensive-perhaps an unsolicited advertisement—I would press a button to add the sender's name to a blacklist shared by people with similar sensibilities. I might set my e-mail program to ignore messages from everyone on that list; I could block only messages from individuals that had been blackballed by some minimum number of people; or I might choose to let all e-mail through unless the sender was given a thumbs down by a particular person whose tastes matched my own. Such community judgment has a selfcorrecting element to it; if I get a reputation for being too thin-skinned (banning too many people) or thick-skinned (banning too few), people will no longer value my opinions, just as people quit paying attention to movie critics with whom they consistently disagree.

Because evaluating messages and Web sites is both valuable and time-consuming, professional Net moderating is likely to become a thriving cottage industry. One such service is SurfWatch, which maintains a database of Web sites with sexually explicit material and blocks access to the sites it deems unfit. Parents (or employers, or schools) pay \$49.95 for the SurfWatch software plus \$5.95/month to subscribe.

While relying on community judgment to restrict access to the Internet can help render the Net less obnoxious, it has a downside. People will tend to expose themselves only to material that reinforces their prejudices—just as subscribers to ideologically opposed magazines grow further apart as they read differently slanted material. And people who trust someone else's moderation will never know for sure that they aren't missing material they would find valuable. SurfWatch, for example, faced controversy in its first month when a user discovered that it had blacklisted the International Association of Gav Square Dance Clubs and other gay-related sites that were not sexually explicit. In response to protest, SurfWatch changed its policies. As Samuel Butler wrote, "The public buys its opinions as it buys its...milk, on the principle that it is cheaper to do this than to keep a cow. So it is, but the milk is more likely to be watered."

ELLEN SPERTUS, a doctoral student in MIT's Department of Electrical Engineering and Computer Science, is doing research at Microsoft on tools for screening access to the Internet.





Robert had churned through a series of white-collar sales jobs on the fringes of the valley's booming, high-tech industries. Then he and Carleen found their own entrepreneurial niche. Working out of their tract home in Milpitas, they started the Amateur Action Bulletin Board System (AABBS), which enabled subscribers to download sexually explicit images and join in chat groups to discuss the materials.

The Thomases' digitized collection reached 20,000 images, largely gleaned from a photographer friend who once worked for Playboy and from magazines published abroad. The most frequently downloaded images depicted partially clad children, bestiality, and bondage. The Thomases promoted their service as "the nastiest place on earth," and advertised on the Net that they accepted Visa and Master-Card. By 1994, AABBS had more than 3,600 subscribers, each paying \$99 per year for the privilege of accessing the collection.

Unhappily for the Thomases, they received too much publicity. In mid-1993, a Tennessee man surfing the Net came across an AABBS publicity post in the form of suggestive picture captions. The surfer, upset by what seemed

fa bulletin-board operator allows a user to post defamatory statements, the victim may sue for libel. But if the operator deletes the posting, the user might claim a violation of the First Amendment.

to him to be child pornography, notified U.S. Postal Service authorities in Memphis. These officials activated Operation Longarm, a government anti-obscenity drive that focuses on child porn and, most recently, computer networks. As Longarm officials see it, the anonymous nature of the Internet makes it the perfect place for

pedophiles to lurk.

The Memphis authorities assigned the complaint to postal investigator David Dirmeyer, who joined AABBS (under the alias "Lance White") and began downloading its images and tapping into its chat groups. Based on Dirmeyer's findings, postal investigators raided the Thomases' home in January 1994, armed with a 32-page search warrant, and seized computers, videotape-dubbing machines, and the AABBS database of photographs and videotapes. The couple was indicted, tried in federal district court in Memphis, and convicted of distributing obscene materials in interstate commerce. Last December, Robert Thomas was sentenced to 37 months: Carleen to 30 months.

The Thomas case reveals the difficulty of interpreting, in a world of computer networks, the meaning of "community standards"—the test by which a piece of work is to be judged obscene, according to the

legal doctrine that the Supreme Court established in its 1973 decision in *Miller v. California*. In *Miller*, the Supreme Court ruled in effect that residents of Bible Belt towns need not put up with Times Square raunch. But in cyberspace, where physical proximity to an information source is unimportant, *Miller*-style community standards are essentially unenforceable.

Civil libertarians worry that if the Thomases' convictions hold, the Net will be governed by the standards of the most restrictive communities in the nation. In appealing their conviction, the Thomases argue that the materials they offered were not obscene by the standards of their Bay Area community. In fact, in 1992 the San Jose high-tech crime unit—essentially the Thomases' hometown police—seized the AABBS computers, scrutinized the collection of images, and found them insufficiently offensive to justify prosecution.

In the United States, individuals have the constitutional right to own obscenity in the privacy of their home, so long as the owner doesn't sell it, publicly display it, or show it to children; a Memphis citizen could therefore fly to San Francisco, purchase a book of AABBS-style photos, and bring it home without breaking any law. Many Net users and civil libertarians would like the courts to treat travel on the information superhighway in the same way—as if Lance White had motored to Milpitas. Indeed, some Thomas supporters argue that the international network of computers constitutes a "community" unto itself for Miller purposes, a frontier that cannot be subjected to offline restrictions. If the Net can't make its own law, then the natives at least want it insulated from the Memphises of the world.

But judges have rejected similar virtual-travel arguments concerning mail-order pornography and phone sex. In the 1989 phone sex case *Sable Communications v. FCC*, Sable argued that the government was creating "an impermissible national standard of obscenity" that forced providers "to tailor all their messages to the least tolerant community." The Supreme Court was unpersuaded, holding that "if Sable's audience is comprised of different communities with different local standards, Sable ultimately bears the burden of complying."

Courts are likely to treat online services the same way. An information provider may be expected to comply with the law's geographic limitations whenever access to its material is contingent on a transaction—such as the payment of money—that allows the purveyor to check the user's locale. Operators of computer bulletin board services, for example, would be made to ask for, and check on, users' locations. They may be required to use an 800 or 900 number that is programmed to block certain area codes, thus ensuring

that people from conservative communities don't log on. The Thomases knew enough law to understand the hazards of letting underage users subscribe (they spotchecked names on credit card orders, calling the listed cardholder to be sure that he or she was the actual subscriber), but neither they nor their lawyer recognized the perils of community standards.

In this respect, members-only bulletin boards like the Thomases' hold less potential for charting new legal ground than cases where material is broadly available on the Internet. In fact, the Net offers many megabytes of raw and unsettling information, almost all of which can be obtained anonymously and for free; there is no way for a supplier of, say, pornographic pictures, to know whether those images are being downloaded in a Bible Belt town.

## 3. When offensive expression is distributed on a computer network, who is accountable?

Are people who post pornographic pictures to a Usenet newsgroup liable for obscenity in, say, Memphis, given that they had no way of knowing where images might be downloaded? Would they be liable if children downloaded the images? For that matter, would the operators of an Internet access service in Memphis be liable for importing obscene material into town, or for making pornographic material (which adults can legally view) unlawfully accessible to children, merely for providing the conduit over which users reached such postings? The law is still murky on these questions of accountability.

As more and more people gain Net access through their schools and employers, such institutions are facing an uncertain future. At Santa Rosa Junior College in California, two female students were the subjects of sexually derogatory comments on a chat group restricted to male students. The women filed a civil rights claim against the college, arguing that the group violated federal law by excluding women and that the messages—discussing the two women in graphic "bathroom wall" language, according to one description constituted sexual harassment. The students demanded that the journalism instructor who ran the online system be fired for aiding and abetting the harassment. The school hastily settled the suit, awarding the women cash compensation for both complaints and putting the instructor on indefinite administrative leave—and, in the process, exerting a considerable chilling effect on the people who run online services at other universities.

Academia isn't the only place where online sexual (or sexist) chatter will collide with freedom of speech. For example, if employers provide desktop access to

Usenet discussion groups, including the gamy alt.sex hierarchy, could they be sued by women workers for creating a "hostile workplace?" In the past, courts have ruled that tacking up *Playboy*-style centerfolds on office bulletin boards can constitute sexual harassment of female workers—is the display of such images on com-

puter screens any different?

The question of responsibility is also pivotal in a suit that Stratton Oakmont, a brokerage firm based in Lake Success, N.Y., brought against the Prodigy online service. Individuals sent a series of postings accusing Stratton Oakmont of criminal behavior and violations of Securities and Exchange Commission rules to Prodigy's "Money Talk" forum. Last year, Stratton Oakmont sued Prodigy for \$200 million in libel damages. Prodigy lawyers argued that the service is a passive carrier of information, like the telephone company. Stratton Oakmont, however, countered that Prodigy is in the publishing business and is therefore responsible for all communication on its service.

A New York state judge ruled that Prodigy, which routinely screens postings for obscene or potentially libelous content, does in fact exert a form of editorial control over content on its system and could be sued as a publisher. Prodigy is appealing the state court's decision. (The man accused of writing the messages, a former Prodigy employee, says someone forged his ID. Such impersonation is relatively easy for even a journeyman hacker, and is bound to become more common—further muddying the waters of responsibility.)

In deciding whether Prodigy is liable for libelous material posted by its users, the appeals court will have to rely on few—and ambiguous—legal precedents. One court ruled that CompuServe was not responsible for material placed on its system by a subcontractor. Another court, however, held that a bulletin board operator was liable for copyright infringements perpetrated by its users. One certainty: if systems operators are deemed responsible, they will monitor users much more closely—and pass on the cost of new staff to their customers. User fees will increase as Net access providers spend money on legal fees fighting off lawsuits.

## 4. How can children be insulated from the Net's raunchier material?

A few years ago, protesters in Fresno, Calif., used a magnifying glass to find offensive textbook illustrations, including what they termed "phallic bicycle seats." A group in suburban New York City recently claimed that it had spotted a drawing of a topless bather in a beach scene in one of the *Where's Waldo?* children's books. After the threat of legal action, the book was removed

from the school library shelves. It doesn't take a magnifying glass to find hard-core pornography on the Internet—and since many youngsters can navigate circles around their elders on the Net, some adults are in a

near panic.

Not without reason. In one afternoon of online prospecting, we unearthed instructions for making bombs, an electronic pamphlet called "Suicide Methods," and a guide for growing marijuana at home. Besides NASA photos of Jupiter, worldwide weather reports, and the Library of Congress catalog, kids can access Penthouse, The Anarchist's Cookbook, and the poisonously anti-Semitic tract, Protocols of the Elders of Zion. It is as if every modem owner in the world including porn fans, skinheads, bazooka lovers, anarchists, bigots, harassers, and Holocaust deniers—selects the books for everyone else's school library. As President Clinton told a meeting of the American Society of Newspaper Editors this spring, "It is folly to think that we should sit idly by when a child who is a computer whiz may be exposed to things on that computer which in some ways are more powerful, more raw, and more inappropriate than those from which we protect them when they walk in a 7-11."

Any user of the Internet can post pornography or sexual invitations to any unmoderated Usenet group: according to the Toronto arts paper *Eye Weekly*, a Canadian recently sent a detailed post on oral sex to newsgroups populated by children. Moreover, the facelessness of the Net makes it impossible to determine who is accessing information. The manager of an adult bookstore can recognize and eject a 12-year-old; the

operator of an Internet file archive cannot.

Several companies are now developing "lock-out" Internet accounts that block access to certain regions of the Net known to contain material inappropriate for children. Many online services, public schools, and universities block out particular Usenet groups—often all of the alt.sex groups; sometimes only the most repugnant, such as alt.sex.pedophilia. Some sites have modified the Internet search tool Veronica to reject requests that include, for example, the word erotica. The American Library Association and other anticensorship organizations are keeping a watchful eye on these efforts to guard children—ready to oppose measures that tip the scales too far away from protection of free speech.

In any case, Net-savvy kids can breach such safeguards. If a school's Usenet system blocks the alt.sex groups, for example, a sufficiently motivated young hacker can use a common Internet tool called telnet to gain access to a system that does offer them. Such surfing gets even easier with the online menu system called gopher; the user can start at a "clean" site and, sooner or



later, reach a "dirty" one. We started from the U.S. Department of Education's gopher server, for instance, and in seven gopher hops reached "The School Stopper's Textbook," which instructs students on how to blow up toilets, short-circuit electrical wiring, and "break into your school at night and burn it down," On the World Wide Web, with its tens of thousands of hyperlinks, similar short hops can whisk a student from a stuffy government site to an X-rated one. Even without access to gopher, telnet, or the Web, students can find plenty of inappropriate material; automated servers in Japan and elsewhere send out individual postings, including those from the alt.sex hierarchy, to anyone who sends the proper command through e-mail.

Most states have laws against giving children pornography, and some also prohibit providing minors with "dangerous information" (for example, guides to building explosives). Thus, in hopes of limiting their

of an adult
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liability, many school districts are requiring parents to sign forms before their children can have Internet accounts-in effect, permission slips for virtual field trips. The lawyers drafting the documents are treading a fine line. A form vaguely referring to the possibility of "offensive material" may not hold up in court as proof that consent was adequately informed. On the other hand, a parental form that is too specific, spelling out the multifold possibilities of pornography, racism, sexism, munitions manuals, and all the rest, may frighten mom and dad into keeping the kids offline altogether-or into shopping for another school district.

Schools will do the best they can to corral children in safe cyberspaces. But will that be enough? Many onliners worry that Congress will in effect mandate that the entire Internet become a child-safe "Happynet." The political pressures may indeed prove irresistible, especially now that the Chris-

tian Coalition is lobbying for laws against online pornography. A Happynet Act would violate the First Amendment, but litigating the case up to the Supreme Court could take several years and hundreds of thousands of dollars.

## 5. How can creative artists protect their online work from digital theft?

A different kind of "free speech" issue involves the possible use of proprietary material. Writers have belatedly discovered that full texts of their copyrighted works are being marketed—without their permission and without compensation—by for-profit data-retrieval companies. Firms such as CARL Corp. and Information Access have in the past typed or electronically scanned in a published piece or writing, uploaded it to a database, and then charged customers for each online retrieval, or "hit."

Earlier this year, both the publishers of Modern Maturity magazine and the owners of the K-III group (which includes New York magazine, among others) ended agreements with Information Access; Reader's Digest has already severed its connections with CARL's UnCover service. In each case, executives not only wanted to retain potentially lucrative rights but were also responding to the threat of legal action from free-lance writers for a share of online royalties.

In a similar conflict, litigation has gone beyond the threat stage. The National Writers Union (NWU), a spirited group representing freelance authors, has filed a federal suit against six large communications companies, including the *New York Times*, seeking damages for "electronic piracy." The suit alleges that the companies have been selling what they don't own, the electronic republication rights to freelancers' contributions—rights that standard freelance contracts didn't cover. The case is slowly proceeding toward trial.

Writers' union representatives have been negotiating with several such services to work out an arrangement for assuring that electronic duplication of magazine articles and books will be accompanied by royalty payments. The precedent is the ASCAP system set up decades ago by the American Society of Composers, Authors, and Publishers, which provides that every time radio stations play a recording the creator gets a few pennies. As a result of these negotiations, some database services have promised to make reprint payments directly to authors who retain copyright.

One knotty issue is whether a "hit" on an electronic

article more closely resembles republication in an anthology or sale of a back issue. This is an important distinction. Freelance writers ordinarily sell one-time publication rights for their magazine articles. If the magazine wants to reprint the article, in an anthology or elsewhere, it must pay the writer something extra. But if the magazine sells additional copies of a back issue, it doesn't owe the writer anything more.

To defend their territory, magazines and newspapers are redrafting their standard contracts to stipulate that writers are selling unlimited electronic rights along with one-time print rights. This development doesn't please writers' organizations, who worry that hungry freelancers will heedlessly sign away rights that may eventually prove valuable. In 1993, the National Writers Union urged the intellectual property working group of the Clinton administration's National Information Infrastructure initiative to prohibit publishers from contractually claiming "those rights (usually electronicbased rights) that do not vet exist, and/or those rights that, at the time of negotiation, lack a measurable economic value." Not surprisingly, publishers opposed the proposal: the administration, faced with more pressing business, did not push the issue. Established writers, meanwhile, have instructed their agents to shop new book projects around rather than sign over electronic rights—in some cases severing long-standing relationships with publishers as a result. Here, as elsewhere, the online technologies are reopening struggles that offline society thought it had settled decades ago.

#### BRAVE NEW NETWORKS

These and other situations reflect the growing conflict between the law and computer-network technology. The legal mind constructs a time and computer-network space-bound world; cybernauts inhabit a world where physical location is immaterial. "Our laws didn't envision the Internet," says Larry Kramer, professor of constitutional law at New York University. In a notable effort to bridge the gap, a new Center for Informatics Law has been established at the John Marshall Law School in Chicago. The center promotes the need to create a separate set of principles just for cyberspace that may depart from the old common-law system.

Rhetorically, at least, the conflict between the old spatial laws and the new Net technology has been onesided. The technologists are better poets, and they have appropriated the most vibrant images to advance their cause. Indeed, the Progress and Freedom Foundation, a conservative Washington think tank, produced a document earlier this year with the less-than-modest title "Magna Carta for the Knowledge Age." The document talks grandly, if somewhat vaguely, of "liberation in cyberspace" from "rules, regulations, taxes and laws"—calling for, among other things, the abolition of the Federal Communications Commission.

In this way, the eager explorers of cyberspace like to draw a parallel between the emergence of the new world information order and the development of the frontier in the American West. This is the conceit promoted by the Electronic Frontier Foundation, which has been working since 1990 to promote online civil liberties. But we find two metaphorically opposed images of "the frontier." One is the heroic, colorized frontier of romantic fiction and television and movies, populated by manly sheriffs and spunky womenfolk. The other is the actual frontier, where life was often nasty, brutish, and short.

Eventually, in both fiction and fact, civilization arrived, bringing with it rules, social order, and taxes. To all but diehard survivalists, this was regarded as progress. The Internet is now undergoing a similar transition, as the new, inchoate medium of unfettered individual freedom begins to evolve. The Wild West of the cyberfrontier is already morphing before our eyes—on the screen and in the courts.

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# MAKING BIOMASS ENERGY A CONTENDER

BY GEORGE STERZINGER

AN a jet engine run on wood chips? Can that engine power an electric turbine to produce electricity economically? Can that improbable combination help policy planners unlock the great, but as yet untapped, potential of biomass fuels to reign in carbon-dioxide emissions and mitigate

the threat of global climate change?

The technology to gasify wood chips and other plant residue, clean up that gas, and use the gas to power a jet engine is, indeed, now working on a small scale. This combination of technologies is emerging as a promising way to make biomass an economical fuel for generating electricity, producing it at 5-6 cents per kilowatt-hour. If the technology can be commercialized and the price per kilowatthour further reduced, burning biomass-derived gas to produce electricity could become a preferred climate-stabilization tool.

As long as crops and trees are continually replanted, generating electricity with biomass fuels adds no net carbon dioxide emissions to the

atmosphere; growth of the fuel removes from the atmosphere the same amount of CO<sub>2</sub> that combustion of the fuel to generate electricity will ultimately release. Emissions of CO<sub>2</sub>, the most important greenhouse gas that results from using fossil fuels to produce electricity, contribute 36 percent of U.S. greenhouse gases.

Unfortunately, a technology's global environmental advantage confers no intrinsic market edge. Still, during the 1980s, elec-



Plummeting fossil-fuel
prices have squeezed biomass
out of the power-generation
market. But to avoid global
climate change, biomass use
will have to increase—and
that means employing
innovative ways to convert
biomass into electricity.

tricity generation from biomass sources quadrupled to about 1.7 billion kilowatt-hours per year—enough to power 280,000 U.S. homes. Recently, owing in part to the dramatic decline in fossil-fuel prices, biomass generation of electricity has stagnated and in some regions has actually dropped. In Maine, for example, highpriced contracts awarded to wood-fired power plants have come under attack in part because oil and gas have become so much less expensive. Biomass is thus playing a minor, incidental role where it plays any role at all. Still, modest public investment in the needed gasifi-

cation/jet-engine systems could turn this

trend around.

It is for biomass the best of times and the worst of times. This is the story of the campaign to unlock the best and displace the worst. In this campaign, I am more than a bystander-I am an advocate. Ever since serving as energy adviser to Vermont governor Madeleine Kunin from 1988 to 1991, I have become convinced that gasification could unlock the potential of biomass as an environmentally sound energy resource. My description is therefore infected with the optimism that naturally arises in someone who is trying to make a technology happen. Such a presentation should not be misconstrued as blind faith, though; I do not think that commercializing these technologies will be simple or easy, only that it will be important.

#### Putting the Technologies Together

Virtually all commercially generated electricity is produced by rotating cop-

per wires through a magnetic field. Until recently, most electric generators used steam to turn turbine blades to turn those copper wires. The steam was produced by burning coal, oil, natural gas, wood, or other fuels in a boiler. The huge steam-kettle generators used in large oil- or coal-based facilities can be quite efficient, converting 35 percent or more of the fuel's energy content into electricity. But this efficiency drops off significantly as generator size decreases.

bind. To achieve efficient generation has required large plants. But unlike fossil fuels, biomass tends to be pro-

Biomass-to-electricity has thus been caught in a

duced in small quantities scattered over large areas; most biomass plants built during the 1980s generated 15-20 GEORGE STERZINGER is an economics and energy consultant in Washington, D.C. He was technical director of the National Wood Energy Associmegawatts and had efficiencies of no more than about 20 percent—that is, 5 BTUs of wood must be burned to produce each BTU of electricity. Providing fuel for a larger, and more energy-efficient, biomass plant would fill the roads and railways with thousands of additional trucks and train cars delivering wood and other energy plants to a centralized facility; transportation costs would render such a project uneconomical.

Gas-turbine engines offer a way around this dilemma. Gas turbines are, essentially, jet engines. They operate by burning a mixture of fuel and compressed

as-turbine

generators—essentially.

jet engines-offer a way

around biomass's economic

dilemma. Unlike traditional

steam generators, gas

turbines provide high

efficiency at small scales,

thus avoiding the need

to transport massive

quantities of biofuel

to huge, central

power plants.

air; the hot, out-rushing exhaust spins a turbine and thus the electrical generating coils that are connected to it. (The turbine is also connected to the compressor that feeds pressurized air into the combustor.) Unlike conventional steam boilers, gas turbines are efficient at the small scale that is appropriate for biomass fuel.

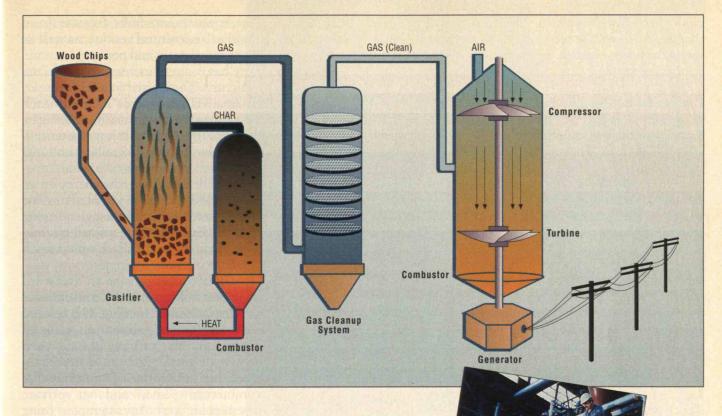
Utilities began using gas turbines in the 1950s. For many years, these machines were less efficient than large steam turbines and were used only to provide short bursts of peak power where the units' low capital cost more than compensated for the much higher fuel cost. But thanks largely to military and aerospace R&D, jet engines have become steadily more efficient. Because turbine blade materials are now able to withstand ever hotter gases, and because thermodynamic efficiency increases with rising temperature, overall engine efficiencies of as high as 35 percent have become commonplace. Military advances were transferred to commercial airline engines and eventually to the tur-

bines used in electric power generation. The turbine generators range in size from a 13-megawatt system based on the engine that powers the McDonnell Douglas F/A-18 to a 45-megawatt system based on the engines used in the Boeing 747.

Gas turbines can be made even more efficient than they are now. One method is to cool the intake air so that it can be more highly compressed—the "intercooling" technique already found in many automobile turbochargers. Further efficiency can be wrung from the system by using the waste heat from the turbine exhaust gases to boil water for a conventional steam turbine in what is known as a combined-cycle operation. Injecting some of this steam back into the compressed air and fuel mixture also raises power output.

Gasification of biomass is a well-established process. It consists, essentially, of heating feedstock fuels in a controlled environment to drive off combustible gases

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without consuming them. But while natural gas from the pipeline has a heating value of roughly 1,000 BTUs per standard cubic foot (BTU/SCF), conventional gasifiers produce much less energy-rich gas, typically 100 to 200 BTU/SCF. The jet engines that offer such an efficient means of generating electricity work best with medium-BTU gases, having at least 300 BTU/SCF. By raising the BTU level of biomass-derived gas, such fuel can begin to compete economically with fossil fuel.

Battelle Memorial Institute in Columbus, Ohio, has developed such a process. Unlike other gasifiers, which were designed for coal, Battelle's system was intended from the outset for use with biomass. For example, gasification of biomass requires only a fraction as much time as gasifying coal; the Battelle system enhances these short reactor times by separating the two basic processes—gasification and combustion into separate vessels. In the gasification vessel, the biomass is converted into a 500-BTU/SFC gas, along with residual char. A cyclone separator separates the char, which is dropped into the combustor vessel and used to heat sand. Circulating sand transfers its warmth from the combustor back to the gasifier, lowering the amount of heat that must be added and thus boosting the system efficiency. Battelle has been developing the biomass gasification system for more than 15 years; over the last year it has begun to run the gasifier in combination with a cleanup system and a gas-turbine generator. The pilot-scale system handles 10 tons of biomass per day, powering a gas turbine that generates 200 kilowatts of electricity.

How to use biomass for economical power production: The biofuel (e.g., wood chips) is heated to drive off a combustible gas. After particulates are removed, the gas is burned in a gas turbine, which runs a generator. The pilot-scale system developed by Battelle (pboto) handles 10 tons of biomass per day, powering a gas turbine that generates 200 kilowatts.

The product gas as it comes from the gasifier contains particulate contaminants that, if not removed, could pit the turbine blades and lower the system's efficiency. A number of strategies can be used to clean up the gas. The Battelle system first cools, or "quenches," the gas to remove condensable compounds. Particulates are then removed from this cooled gas with paper or

cloth filters. Battelle is also developing a catalytic process that breaks down the tars and oils that otherwise build up on the turbine blades, weighing them down and lowering efficiency.

### Biomass in the Energy Marketplace

Green wood chips, a common form of biomass, now cost \$17 per ton. That would have been an attractive alternative to fossil fuels at prices that many analysts were expecting by now; in the early 1980s, the nearly

universal prediction was for oil and gas prices to continue to rise. But as the well-head price of natural gas has plummeted to one-fifth of its 1983-84 level, biomass does not enjoy the huge price advantage proponents once thought it would.

To further weaken the competitive position of biomass fuels, natural gas can be converted to electricity in gas turbines, at much higher efficiency than biomass can in a conventional steamkettle generator. Because of that efficiency penalty, wood becomes competitive with natural gas only when it can be delivered at \$12 per ton—well below the prevailing market price. But gasifying the wood allows it to take advantage of the same high-efficiency gas turbines that are available to natural gas. The increase in conversion efficiency leads to a proportional increase in the price that a utility can pay for the fuel.

In particular, a change in efficiency from the 20 percent typical of "tea kettle" boilers to the 35 percent offered by a gas turbine would permit a utility to buy wood at more than \$20 per ton instead of \$12.

Once the conversion of the turbine is available, the economics of biomass-to-electricity becomes much more appealing. Several agricultural studies have looked at the possibility of using marginal, erodible land to grow an energy crop such as switchgrass or poplar trees. But growing and harvesting switchgrass, for example, costs \$40 to \$50 per acre per year. If we assume that a utility is permitted to charge its customers 6 cents per kilowatthour, and the capital cost of the generator is 3 cents per kilowatthour to pay for fuel.

Is that enough money to support growers? The answer depends on how many kilowatt-hours the utility can wring from each ton of fuel. At the 20 percent efficiency of small steam-kettle generators, the utility cannot afford to pay the growers what they need; at the higher efficiencies offered by gas turbines, the utility can. Similar calculations apply to a diverse range of biomass

fuels, including forest wastes, rice hulls, bagasse (from sugar cane), and other agricultural residue, as well as energy crops such as switchgrass and poplar.

Biomass clearly has room to increase its role in the national energy picture. The United States consumes roughly 80 quadrillion BTU, or "quads" of energy each year, only 3 quads of that from biomass. But studies by the Department of Energy estimate a huge potential. The United States now has between 35 million and 200 million acres of marginal land unsuited for food production. Using most of this land to grow energy crops

would yield enough biomass to provide as much as 55 quads of energy, according to DOE. Even devoting a small fraction of this land to energy plants would result

in a huge increase in supply.

The technology is at an awkward stage that falls outside the conventional purview of public funding. It is beyond basic R&D—the gasification, cleanup system, and gas turbine all have been shown to work. But the system as a whole has not yet been demonstrated at commercial scale, and so private investors are leery. Any attempt to bring the technology to market would pose substantial economic risk to the developer, who must negotiate the matrix of

legal, financial, and environmental issues inherent in any first-of-its kind applica-

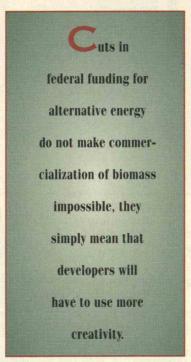
tion. These types of commercialization efforts are often undertaken by under-

capitalized start-up companies for whom

the trek from R&D to revenue-generating, mature technologies has been likened to one through a Death Valley—strewn with the remains of companies whose money ran out before their technology caught on.

U.S. energy and environmental policymakers are starting to experiment with ways to help shepherd technologies through this wilderness phase of development. Public funding can elicit the interest of private investors, whose risk is reduced in proportion to the level of federal participation in the project. By jointly participating, federal and private interests check one another. The private sector invests in hope of market success, while the government invests in pursuit of public benefit.

The signs are good for eliciting private interest and capital for such a joint venture in biomass. The Battelle biomass gasification process is licensed by Future Energy Resources Co. (FERCO), an Atlanta-based company (for whom I provide occasional consulting service). Later this year, FERCO will start building a gasifier for testing on the site of an existing wood-fired power plant operated by Burlington Electric in Burlington, Vt. The objective will be to show that gasification works at com-

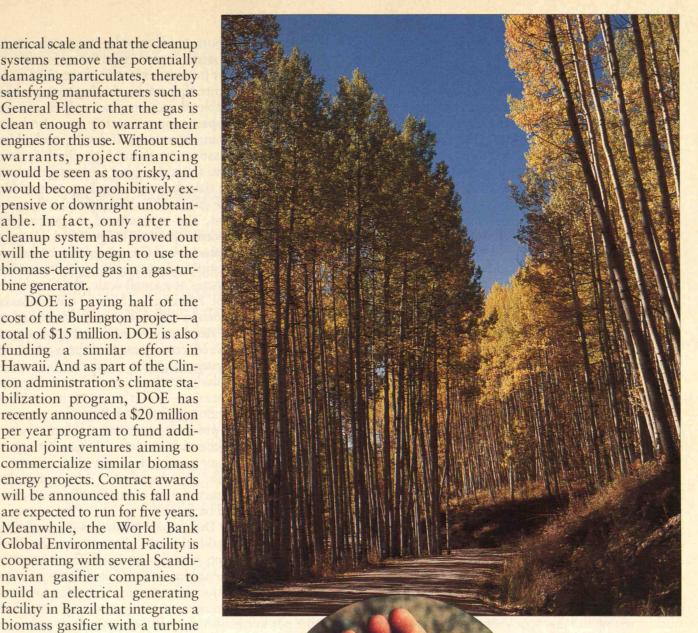


merical scale and that the cleanup systems remove the potentially damaging particulates, thereby satisfying manufacturers such as General Electric that the gas is clean enough to warrant their engines for this use. Without such warrants, project financing would be seen as too risky, and would become prohibitively expensive or downright unobtainable. In fact, only after the cleanup system has proved out will the utility begin to use the biomass-derived gas in a gas-turbine generator.

DOE is paying half of the cost of the Burlington project—a total of \$15 million. DOE is also funding a similar effort in Hawaii. And as part of the Clinton administration's climate stabilization program, DOE has recently announced a \$20 million per year program to fund additional joint ventures aiming to commercialize similar biomass energy projects. Contract awards will be announced this fall and are expected to run for five years. Meanwhile, the World Bank Global Environmental Facility is cooperating with several Scandinavian gasifier companies to build an electrical generating

engine. Unfortunately, most federal participation in the development of this technology seems to be following what might be called a "single bullet" theory: the government is willing to provide start-up injections of funding to launch the technology on the road to commercialization. After that, the thinking goes, the private sector should bring the systems to the "turn key" stage of maturity that would allow them to compete with long-established power-generation technologies.

While parsimonious use of federal resources plays well in times of fiscal restraint, the apparent economy can be false. The first design will probably be overengineered; while it will establish that the new process can work, subsequent projects, with design modifications, will be needed to establish optimum performance. Beyond the first tentative steps toward commer-



U.S. agricultural land includes as much as 200 million acres that is unsuited for food production. Devoting even a small fraction of this marginal land to quickgrowing plants such as poplar trees (above) would greatly expand the supply of wood and other biomass that can be converted to gas for generating electricity.

PHOTOS: GRANT HEILMAN: NBIA TECHNOLOGY REVIEW 39 cialization lie many clearly identifiable challenges, any one of which could stop development in its tracks and render the earlier funding pointless. The technology, for example, must be able to commercially use a variety of fuels. This will require significant development in many aspects of the system—the cleanup process, the vessel

sizes, the fuel-handling systems, and the agricultural infrastructure need to produce the energy crops. In an extremely competitive energy market, each of these incremental steps presents a risk.

To avoid this single-bullet syndrome, the process of support for technology commercialization should be rethought. Instead of simply delivering grants, the Department of Energy should work in partnership with state governments, other federal agencies, and private foundations to integrate all potential forms of support. And rather than simply allocating grant money, the government should treat public financing as investments, negotiating with technology companies for some participation in successful commercialization. One way to get more for the public dollar is to choose projects that have a potential international market. Companies would be willing to use U.S. development as a "loss leader" if they had confidence that a successful program would lead to sales of systems overseas.

Efforts in this direction are being made. In Nevada, a small amount of federal funding is being leveraged by state money for a solar-energy demonstration project; the project uses federal and private land, including a nuclear testing site that spans some 1,400 square miles. That sort of collaborative effort needs to be duplicated for other renewable fuels, including biomass. The expected reduction in federal funding for alternative energy development does not make the commercialization of biomass technology impossible, it just requires more creativity.

#### The Global Potential

A growing fraction of the world's energy is being consumed by countries in Asia, Latin America, and eastern Europe. Advocates of renewable-energy technologies have tended to lament this changing balance; if renewable projects have a hard time competing against fossil fuel projects in the United States, the refrain goes, how can it possibly gain a foothold in countries with much looser environmental regulation?

But environmental regulations are not the only or

even the most important factor influencing a country's choice of energy sources. In the United States, fossil fuels benefit enormously from the existence of a massive dedicated infrastructure that no developing country has available. Renewable projects may not only be able to compete in developing economies, they may also have

an important edge. If developers build a massive new natural gas-fired electric plant in an emerging economy, chances are that they will also have to pay for new gas facilities and pipelines. By contrast, the agricultural infrastructure needed to produce biomass fuel is largely in place. And because plants based on gas-turbine generators could attain efficiencies at a small scale, they could be kept running with only the biomass grown in the nearby environs, reducing the need for extensive transporting of fuel. Moreover, much of the work done to integrate gasifiers with turbines—particularly development of the gas cleanup processes—will also serve in another technology that holds long-term promise for producing electricity. Fuel cells—electrochemical devices that generate electricity quietly, cleanly, and efficiently— "run" on hydrogen, which can be extracted from natural gas or from gasified biomass.

Developing countries are building fossil-fuel power plants to generate elec-

tricity at 6.5–8 cents per kilowatt-hour. That's a pretty easy target for renewables. In the United States, in contrast, new generation projects are competing for contracts where the requirement is to generate power at 5–6 cents per kilowatt-hour, and occasionally even lower than that. What's more, many developing countries have substantial agricultural wastes that can keep the biomass gasifiers busy. Over the past year, Secretary of Energy Hazel O'Leary has led delegations to India, Pakistan, and China and found those countries eager to cooperate with the United States in providing applications for this technology.

Overall, a "no pain, no gain" philosophy seems to be the basis of many notions for attacking global climate change. But a climate-stabilization initiative based on biomass-derived gas would not rely on carbon taxes or on the market disincentives provided by artificially high fossil-fuel prices. This option provides a potentially less disruptive avenue toward climate stabilization. Public investment to mitigate the risk of commercializing the gasification and gas-cleanup technology could pay off in substantial environmental gains without the economic dislocation threatened by other strategies.

October 1995

### Dear MIT Alumnus/Alumna:

I am writing to enlist your help in an exciting Alumni Association initiative! It's no secret that the job market has significantly changed, shrunk, and been redefined. MIT graduates aren't immune to these changes; you yourself may have been affected, and thus the Alumni Association finds itself inundated with requests for career help. In order to respond in a meaningful way, we're asking if we could include you on a data base of alumni/ae volunteers who can be contacted to speak with students, new graduates or mid career alumni/ae, to advise them about career paths within your company or interest area.

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Whether you have maintained ties with the Institute or not, we hope you will participate in this important program. Please take a few minutes now and in the future to help current students and alumni/ae by serving as a mentor. Feel free to contact our office if you have any questions or comments at 617/253-8242. We would appreciate receiving your reply no later than **November 15**, **1995**.

Janet Serman

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Alumni Career Services Officer

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INSTITUTE CAREER



October 1995

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# INSTITUTE CAREER ICAN ASSISTANCE NETWORK

ICAN is a program through which MIT students and alumni/ae can network with other alumni/ae for career planning or job search assistance. Using our alumni database, students and alumni/ae can select people in a particular geographical area whose occupation or career matches their interest. MIT Alumni/ae can offer a variety of assistance, from providing advice about careers to identifying actual employment opportunities and contacts within their companies. These may include summer jobs, internships, or "shadowing."

In addition to this important networking service, the Alumni/ae Association can also provide the following services to MIT alumni/ae:

- · Compendium of executive search firms
- · Bibliography of self-help materials
- A list of employment resources from MIT's Career Services Office
- · Career fairs and seminars

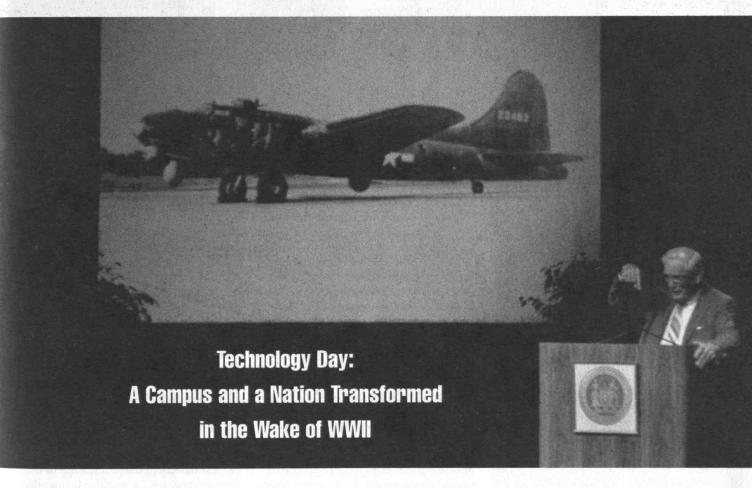
To volunteer as an ICAN mentor or to receive more information, please complete the attached form and return it postage-free to:

Institute Career Assistance Network MIT Alumni/ae Association 77 Massachusetts Avenue, Bldg. 10-110 Cambridge, Massachusetts 02139

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# MIRWS

From The Association of Alumni and Alumnae of MIT October 1995



n the middle of a sparkling June day, a half-dozen vintage World War II planes flew east over the Charles River and swung back over the MIT campus, a spectacular finale to the 1995 Technology Day morning program. The flyover, as President Charles Vest re-marked, was meant "not as a celebration of military hardware but as a tribute to all those alumni and alumnae who lost their lives in the war."

Still, as they gathered on the lawn to watch the distinctive planes roar by, it must have been almost impossible for alumni/ae not to think of the unprecedented rallying of resources they had heard about that morning. In a few short years, the efforts of enlisted men and

By LISA WATTS women, the nation's civilian workforce, e and faculty and staff at research universities helped this country build its eco-

sities helped this country build its economic muscle while leading the Allied effort to win the war.

Looking back over the last 50 years, Technology Day speakers offered some perspective on the broad changes set in motion, on campus and across the nation, by this country's involvement in the war. The challenge for the future, as several speakers noted, is to rally such economic and technological resources without the crisis of war as the incentive.

Commenting on this year's program in a congratulatory letter to James Draper, '62, chair of the Technology Robert Seamans, ScD '51, reported on the campus in war mode from the perspective of one who was in the thick of it.

.....

Day Committee, Vest described it as "a truly extraordinary event." His numerous conversations with graduates, more than one of whom would have liked to see the program transmitted worldwide as a teleconference, convinced Vest that the morning program "left people thinking quite deeply about MIT—valuing it more than ever, worrying about the present, and vowing to keep the future strong."

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## **Technology Close to Home**

Hardly a day goes by when a graduate doesn't say to one of the editors, "With everybody using computers and e-mail, putting out the Class Notes should be a piece of cake. Why does it take so long for my notes to get into print?" Well, consider our situation: we receive some 70 class columns: by mailed hard copy, either typed or handwritten, possibly in pencil; by fax; by mailed disk, either DOS or Mac, 3.5- or 5.25-inch disk; and by e-mail, using protocols that inject strange characters and formats. Questions and special requests arrive by all those routes plus telephone and voicemail. Where once each class had a secretary and possibly an assistant, it now may have those two plus an e-mail list manager, sometimes all sending in material separately. Now, we love technology—particularly e-mail. It helps make Class Notes richer and more interesting. But fast or simple it's not. -Susan Lewis



Pam Whitman and Steve Barr (right), both Class of '70 (and married), returned to admire their handiwork, the dollar bill painted around the Cashier's Office.

Historian Doris Kearns Goodwin (bottom right) was impressive as a speaker for—and reportedly was impressed as an observer of—the T-Day morning program.

#### The Roosevelts' Leadership

Historian and author Doris Kearns Goodwin opened the program by looking at the war's impact on the home front. Every seat in Kresge was filled and listeners were swept along as Goodwin spoke of how the wartime efforts of President Franklin D. Roosevelt and his wife, Eleanor, reshaped this country as a more egalitarian society. The Roosevelts are the subject of Goodwin's latest political biography, *No Ordinary Time*.

Goodwin first painted the picture of America's bleak economy and morale just before the war. In 1940, the country was still in the grip of the Depression, she said, with unemployment at 17 percent. Just one in four Americans graduated from high school; one in twenty graduated from college. In size and readiness, the United States Army trailed those of most European countries—ranking 18th in the world, with no modern tanks or guns in its arsenal.

But as the country's entry into the war became inevitable, President Roosevelt undertook a remarkable mobilization of resources, what Goodwin called "an unparalleled partnership between business and government." More than 17 million jobs were created as the buildup of vehicles, arms, and supplies began, Goodwin said. In only a few years, America positioned itself as the world's leading military force.

The millions of new jobs—many of them filled by women going to work for





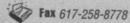
the first time, on factory lines and driving trucks—produced a genuine, salaried middle class, Goodwin noted. After the war, the middle class was reinforced as the G.I. Bill sent millions of veterans to college. Meanwhile, women and blacks had tasted the liberation of earning decent wages and gaining job training, giving fuel to the civil rights and women's movements, she said.

Goodwin believes such sweeping social changes were accomplished in large measure because of the unique partnership of Franklin and Eleanor. "Franklin had such confidence in himself and in the country's strengths, and he communicated that confidence to the American people," she said. Meanwhile, his wife's "remarkable ramblings around the country" allowed her to witness working conditions and racial injustice, observations that she brought back to her husband and his aides. She pushed Franklin constantly on civil rights in the workplace and in the services. When the war began, enlisted blacks served only at the lowest rungs. By the war's end, blacks were serving as pilots, doctors, and in other leadership positions, thanks in large measure to Eleanor's steady

While the Roosevelts had a complicated relationship first darkened by

Let us Know What You Think









Members of the Class of '60 display their reunion souvenir, a towel designed as a "four dollar slavery certificate." The towel is helpful, we presume, to grads who've been "hosed." It features a jaunty photo of James R. Killian, Jr., '26, who was president of MIT when they arrived and Corporation chair when they graduated. James Draper, '62 (above right), has good reason to smile: the Technology Day Committee of which he was chair put on a program that was a resounding success in terms of attendance and response.

Franklin's affair with another woman, Goodwin sees the marriage as less scandalous and bitter than have other writers. The two shared a goal of making life better for the American people, work they pursued even as Franklin's health declined. He died in April 1945, a month before Germany's surrender.

"Eleanor has said that she witnessed a transference of energy over the course of the war," Goodwin said. "Franklin began the war strong while the country was weak. By the end of the war, the country was invigorated, but Franklin had grown sick."

#### A Campus on a War Footing

At MIT, the war presented the need for new academic subjects and fields of study, year-round rotations of intense courses to train members of the military and support services, and a massive research effort to develop new technologies. Chief among MIT's contributions to the war effort were the advances in radar technology that came out of the legendary Radiation Laboratory. "It has been said that the atomic bomb ended the war, but radar won it," said Robert Seamans, ScD '51, the next speaker up to the T-Day podium.

Seamans, who first came to MIT as an instructor and graduate student with Charles Stark Draper in 1941, and who went on to such posts as deputy administrator at NASA during the Apollo Program and dean of engineering at the Institute, is now a senior lecturer in aeronautics and astronautics.

During the years 1941-45, he noted, a third of the staff took leaves of absence and a quarter of all alumni were in the military. Here in Cambridge, MIT administered 400 research and development contracts valued at \$93 million and ran programs of education and training for which it received \$5 million in government reimbursement (all in 1945 dollars). There were 2,300 graduates of the Navy V-12 and Army specialized training groups; 7,275 Army and Navy personnel attended Radar School; and nearly 1,000 individuals were trained in meteorology and weather forecasting here.

Elsewhere on campus, staff, students, and faculty were pressed into service on a wide range of projects, from improving surgical sutures and X-ray technology to advances in aeronautics, instrumentation, synthetic rubber, and food packaging. The Wright Brothers Wind Tunnel operated 16 hours per day to test models of military aircraft.

#### A Campus Transformed

When the war was over, MIT emerged as a national leader, Paul Gray, '54, chair of the MIT Corporation, told T-Day participants. "Engineering education at MIT was at the vanguard and set the pace for education across the country, leadership that has continued



since," Gray said.

The G.I. Bill "democratized the student body," Gray said, bringing war veterans to campus as older, highly motivated students. Enrollment, which had peaked at 3,100 before the war and slumped to 1,200 in 1945, climbed dramatically to 5,000 in 1947. Buildings went up to meet the new need for married-student housing and additional classroom space. Most of the incoming veterans couldn't have afforded to attend MIT without government support, he said, and their arrival was a preamble" that set the stage for needblind admissions and full, need-based financial aid 20 years later.

While the Cambridge campus had to accommodate the flood of students and an enlarged faculty to teach them, Gray said, the engineering curricula had to accommodate new fields that evolved from defense technology—fields such as microwaves, control systems, and analog computation—as well as the permanently accelerated pace at which new technology would continue to develop.

In that environment, the MIT faculty made major revisions in engineering education, he said, emphasizing the underlying physical and mathematical foundations as well as new technology and engineering design.

The wartime lessons of the partnership between government and universities, when distilled into the monumental report, "Science, the Endless Frontier," by Vannevar Bush, '16, and his colleagues in Washington, established the model for the federal patronage of campus-based research and of graduate education in science and engineering that has been in place for the last 50 years.

The Cold War—of which the post-Sputnik competition in science and technology was one element—provided a rationale for continued growth in both research and graduate education, said Gray. Between 1958 and 1968, for example, when he was launching his own career at MIT as professor of electrical engineering, the volume of sponsored research increased in constant dollars by a factor of five. By 1970, the number of students had increase to 8,000, close to half of whom were graduate students, and the faculty was just over 1,000.

That era ended when the fiscal demands of the war in Vietnam clashed head-on with those of Lyndon Johnson's "Great Society." With the exception of the Reagan years, 1983 through 1989, Gray said, there has been no real growth in resources to match the growth in size and complexity of the country's university-research establishment. Tuition grew rapidly in the 1980s, as did the need for more and more financial support for individual students.

Gray believes that today we are seeing the beginnings of a "war" on the federal deficit that involves a reassessment of national priorities and will ultimately have an impact on universities as significant as the impact of WWII and the Cold War. Troubled as the relationship is now, he sees no alternative to cooperation between government and universities. "On that partnership," Gray told the T-Day audience, "depends the well-



At far left, wearing a tropical beach painting to match his Hawaiian shirt, is William Hecht, '61, executive vice-president of the Alumnilae Association. The various reunion classes are loosely clustered on the steps of Kresge, in color-coded neckerchiefs, so they can pool their efforts on the Alumni/ae Bowl, the cerebral segment of the competition.

being of higher education and the nation it serves."

#### **Engineering the Economy**

Elaborating on the changes Goodwin mentioned, economist Lester Thurow talked of how the United States economy has evolved because of policies developed during and after the war.

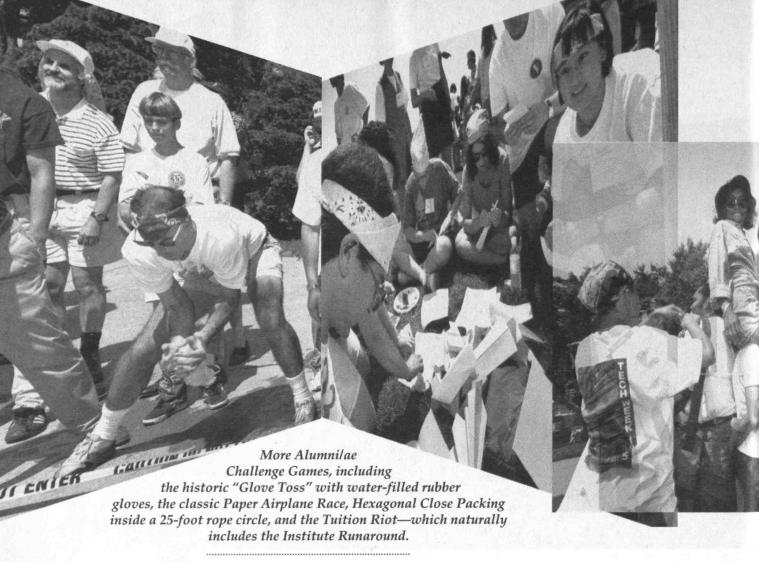
"A major war shakes up the system, makes people willing to do things they're not usually willing to do. The Great Depression and World War II were a double shake," said Thurow, the Lemelson Professor of Management and Economics at the Sloan School.

Not only did the war spur the creation of a middle class and greatly enhance wage scales, Thurow said, but it also ushered in the concept of a social welfare state, based on the idea that "when you're old, unemployed, or sick, you won't be thrown off the ship of state."

A business-labor social contract evolved, Thurow noted, with the basic principle that "if you are running a company and the profits go up, you will share some of that with your employees."

The United States opted not to "retreat back into isolationism" following the war, but to become international, aiding Europe through the Marshall Plan and opening American markets to more foreign trade. Various regions have embraced the American market model in the ensuing decades—Europe in the 1960s, Japan in the '70s, other Asian nations in the '80s, China in the '90s. "We became the world's locomotive," Thurow said.

The most important lesson of WWII may have been learning "that you could engineer a rapidly growing economy," he said. The test of the next decade or so will be how well our country can mobilize itself without the rallying force of a world war or similar crisis.



"Our country was sold internationalism as anti-communism," Thurow said. "That seems to have had a half-life of 50 years, where we are at present. The anchor points are gone now. There is no enemy out there."

#### Rebuilding the Partnership

President Vest closed the Technology Day program by looking to the future of science, technology, and the relationship between research universities like MIT and the government.

The great leap in research breakthroughs prompted by World War II can be repeated, Vest said, in an address whose themes he would revisit in his remarks at the National Press Club (see page MIT 11). The Institute's faculty and student body continue to be the most gifted in their fields; and curriculum changes here still lead the nation in the renewal of science and engineering education.

But Vest cautioned that the foundation for this record of achievement—the partnership between research universities and the federal government to which Gray referred—has been suffering in the last decade, with Congress cutting back on overall support of university research and graduate education while constantly shifting its priorities.

"Science and technology are a continuum, they cannot be turned on and off at will," he said. Government has to relearn its lesson from World War II that research is an investment, not a cost, he said.

Vest puts some of the blame on universities for isolating themselves too much in the last few decades and for being inflexible. His goal, he said, is not for research universities to maintain the status quo but to join in "a newly invigorated partnership" with government and business.

Looking back, it seems that partnership enjoyed its heyday when the urgency of world war, emerging technologies, and strong political leadership all coincided. But Vest believes that synergy can be recreated. "MIT's future," he said, "can be just as exciting as its past."□

## Reunion Gifts Top \$14.7 Million

Reunion class gifts of more than \$14.7 million were announced at MIT's annual Technology Day luncheon in the Howard Johnson Athletics Center. The occasion drew more than 1,000 people—alumni and alumnae, with members of their families and guests—some of the more than 2,700 who participated in reunion week activities.

Presiding over the luncheon program was Gary Schweikhardt, SM '73, the 1994–95 president of the Association of Alumni and Alumnae. The most senior alumnus at the luncheon was 95-year-old



Malcolm "Buzz" Burroughs, '20, of Topsfield, Mass., celebrating the 75th anniversary of his graduation. Schweik-



At the T-Day luncheon, President Charles Vest (second from left) had the happy task of accepting gifts totalling more than \$14.7 million. He is shown with class reunion-gift chairs (from left) Greg Arenson, '70, Dennis Shapiro and DuWayne Peterson—co-chairs for '55, and James Levitan, '45.

hardt also welcomed 243 members of the Cardinal and Gray Society who were on hand, including the "freshmen" members from the Class of 1945. The Society is an informal association of alumni/ae who have reached their 50th reunion.

Also present, Schweikhardt said, were 15 international alumni and alumnae representing Canada, England, France, Germany, Switzerland, Taiwan, Thailand, and Venezuela. The attendee who traveled the greatest distance was Anita Horton, '75, who arrived from Bangkok.

A highlight of the program was the announcement that the Alumni/ae Association, in keeping with tradition, was bestowing honorary membership on individuals "whose dedication, commitment and loyalty to MIT make them truly extraordinary." The surprised honorees included Philip Morrison, Institute Professor emeritus, and Mary Morrissey, director of the Information Center and special events.

Schweikhardt said that Professor Morrison "has repeatedly given up weekends and evenings for Association programs and Association needs. It seems he has never used the word 'no' when called upon by alumni/ae. His long and distinguished MIT career has been marked with sustained assistance to the Association, supporting our programming and Institute development."

Morrissey, Schweikhardt noted, "has played a seminal role in every Commencement and presidential inauguration for years, imparting a style and a substance to Commencement that has had an effect on every graduating class. . . . She has always felt that Commencement's emphasis should be primarily for the students and their families, but has welcomed the alumni and recognized their importance at the proceedings."

A third honorary membership was bestowed on MIT's former provost, Mark Wrighton, at the June meeting of the MIT Corporation, just before he left to take over as chancellor of Washington University in St. Louis. In remarks on that occasion, Schweikhardt said that Wrighton "has enthusiastically offered his time, ideas, and support to alumni



We've all heard of "back of the envelope" calculations; but this "back of the head" face painting was in a class by itself. So was the BAMIT "Oldies But Goodies" party in Walker, where Rosita Dunn, '75, BAMIT reunion chair, and Walter Gibbons, '74, were among the groovin' dancers.

programming and development, especially the Alumni/ae Leadership Conference and Technology Day. In an organization . . . populated by extremely busy men and women with extraordinary demands made on their time, Mark Wrighton has always been available, often with very little notice."

Gifts for the major reunion classes were presented by Gregory Arenson for the 25th Reunion Class of 1970, DuWayne Peterson and Dennis Shapiro for the 40th Reunion Class of 1955, James Levitan for the 50th Reunion Class of 1945 and Samuel Spiker for the 70th Reunion Class of 1925. Of the 71 living members of the Class of 1925, eight returned to celebrate their reunion.

- The Class of 1925: \$1,887,381.
- The Class of 1945: \$4,094,832.
- The Class of 1955: \$3,039,721.

■ The Class of 1970: \$918,813, which included the establishment of a Jerome Wiesner Fund to honor the late MIT president. The class hit a new record

with participation by 77 percent of its living members.

The gifts of these reunion classes comprise all gifts made to MIT by members of the classes during the five-year period preceding the reunion and all pledges to be paid in the five years following the reunion.

It was announced that the Alumni/ae Fund was expected to (and did) pass the \$21 million mark by June 30, the second highest amount ever recorded.

Schweikhardt also acknowledged the gifts of non-reunion-class alumni/ae and MIT graduate alumni/ae to the Fund. He said 30 percent of graduate alumni/ae made contributions to the Institute and their departments, resulting in a record-setting gift of \$4 million. It has been estimated that by the year 2000, alumni/ae who hold only graduate degrees will outnumber those holding undergraduate degrees, Schweikhardt said.

In accepting the gifts on behalf of the Institute, President Charles Vest, who was made an honorary member of the Association last year, thanked the alumni/ae for their "splendid reunion class gifts," noting "that this kind of sustained, generous support is essential to the vigor and excellence of MIT." Such support has made the difference over the years, he said, "as MIT grew from a small technical institute in 19th century Boston to a truly world-class research university located in Cambridge." He added, "Today's program is a powerful demonstration of the difference that the faculty and graduates of MIT have made

#### OTHER REUNION GIFTS:

\$1,718,884 from the Class of 1930; \$972,477 from the Class of 1935; \$605,433 from the Class of 1940; \$195,729 from the Class of 1950; \$384,303 from the Class of 1960; \$230,200 from the Class of 1965; \$486,900 from the Class of 1975; \$103,485 from the Class of 1980; \$47,656 from the Class of 1985; \$22,427 from the Class of 1990; and \$54,000 from the Class of 1995. and continue to make throughout the world.

"MIT's excellence has been well recognized," Vest said, citing some significant indicators: four Nobel prizes in four years; top rankings this year by U.S. News & World Report in its annual survey of American universities; a "stunning" increase in applications for the freshman class—nearly 8,000 total—and equally stunning quality, with 86 percent of accepted stu-

dents ranked in the top 5 percent of their high school classes; and "incredible new faculty," a reference to more than 110 new faculty members hired during the

last five years.

At the conclusion of the program, Schweikhardt handed the symbolic gavel of office as alumni/ae president for 1995–96 to Karen Arenson, '70. Now a national correspondent for the *New York Times*, Arenson received an SB in economics from MIT and a master's in public policy from Harvard. She is the 101st Association president and the third woman to serve in that post.

## 25th Reunion for the Class of '70: You Can Go Home Again

s students, members of the Class of '70 were remembered for, among other things, facing Cambridge Police outfitted in riot gear, occupying the office of MIT President Howard Johnson, and helping to provide sanctuary for a Vietnam War resister. Feelings ran so high on all sides during their senior year that the Institute cancelled the end of second semester to avoid further and potentially dangerous confrontation.

This year was their 25th Reunion—traditionally a class's first big outpouring of nostalgia, fellowship, and gratitude for the benefits of an MIT education. But the Alumni/ae Association staff and



The Class of '70 launched its Saturday morning reunion program with a hilarious class-survey presentation by Tony Picardi.

classmates themselves wondered how many members of the Class of '70 would want to come back at all. Planners also worried that those who did might feel alienated from the proceedings, since Technology Day focused on the impact of World War II on the nation and the Institute.

Well, as Karen Arenson, '70, reports in her Class Notes for this issue, "The buzz around the Institute is amazing—and amazed." The Class of '70 not only broke the 25th-reunion attendance record and the 25th-reunion-gift participation record, they impressed everyone, including themselves, with the warmth and intensity of their feelings for each other and for their MIT experience.

That feeling was readily apparent to the casual observer at their Saturday morning session in 10-250, which opened with Tony Picardi's analysis of the class questionnaire. Waves of laughter greeted his statistical comparisons between classmates and between MIT grads and their Harvard peers. This was the first class survey that included a "SNAG coefficient," which indicates the degree to which the males of '70 now identify themselves as Sensitive New-Age Guys. (Sadly, a high SNAG coefficient does nothing for job or even marital satisfaction, Picardi reports.)

The mood of the program changed dramatically with Steve Carhart's "video memoir," which wove together still photographs and media footage from the national and local events of their undergraduate years. Carhart's images served as a reminder that for many of their generation, the issues they debated were a matter of life and death.

And in the case of George Katsiaficus,

they were issues that he cared about, acted on, and wound up in jail over, thereby missing his own graduation. Speaking after the video, he recalled that the nationwide strike in November 1969 involved more than 4 million students, about half a million faculty, and members of several labor unions. As Richard Adelman put it later in the discussion, this class "was close to great events."

But not everybody saw things that way at the time. Former class president Joe Bisaccio admitted that, to him, the demonstrations had seemed "an incredible inconvenience." While he certainly did not support the war, he was worried about how he could set up for the junior prom in the midst of all the political turmoil. Bisaccio's classmates genially applauded his candor, then exploded in laughter when Eric Clemens remarked that "Joe has earned a group hug."

It was like that all morning, as participants bounced between hilarity and moving self-revelation. Adelman reported picking up his degree at the registrar's office just days before he received notice that he had been expelled. Classmates reported that Technology Day '95 helped them to finally understand World War II, their parents' war. There was a chorus of remembered confusion, of career plans derailed, of needing years to regain (or find an alternative to) a dedication to science and technology that had been contaminated for them by the war machine.

Laughter and more conversation continued through the Techsas Barbecue, through the Alumni/ae Challenge Games—"Hexagonal Close Packing" was won by the exuberant Class of '70—through the Sha-Na-Na concert, and even into the night, as stragglers from the concert found an open classroom and kept talking. "They just couldn't get enough," remarked Eliza Dame, the Alumni/ae Association staff member who oversaw reunions.

It is axiomatic that MIT graduates are tied together by the sense of shared struggle; they all drank from the firehose and survived. Evidently, an extra level of struggle, even pain—like the experience of WWII or the moral and political turmoil of the '60s and '70s—just forms more bonds and a tighter community.

Even if the going got tough, the tough still go home. □ —SUSAN LEWIS



## President Vest Addresses National Press Club

From the first months of his presidency at MIT, Charles Vest recognized and set out to meet head-on a major issue: the increasingly complex and somewhat strained relationship between the federal government and the research universities. Vest added to his responsibilities in Cambridge a demanding schedule of meetings with individuals and small groups in Congress, the Administration, and various federal agencies, making the urgent case not only for the Institute but for the future of research and education in science and technology nationwide.

His effectiveness in that role was recently recognized by the *New York Times*, which referred to him in a June 28 article as "the unofficial spokesman for research universities in Washington." The *Times* went on to note, for example, that a scheduled 15-minute meeting between Vest and House Speaker Newt Gingrich was extended to 90 minutes at the request of the speaker, who said later in an interview with David Brinkley that he wanted to "find every possible way to maximize the money that goes into research."

On July 18, President Vest had a welcome opportunity to widen the discussion by addressing the National Press Club in Washington, D.C., putting before an audience of policy makers and media representatives (and ultimately the public) the set of issues, threats, and challenges that he and his peers in the research universities see as critical to the nation's future. Many leading alumni/ae from the Washington area, including former Alumni/ae Association presidents Harris Weinstein, '56, and Mary Frances Wagley, '47, were among those who turned out for the occasion.

The response to Vest's remarks has been overwhelmingly positive and continues to grow, as the speech has been reported, discussed, carried nationwide on C-SPAN, and entered into the Congressional Record (by Senator Edward Kennedy of Massachusetts). Following is a slightly edited text of the speech, plus a sampling of the questions posed by members of the audience. —*Ed*.

appreciate the opportunity to talk with you this afternoon. Next week, this Club will hear from Jim Lovell, the astronaut who commanded the Apollo 13 mission. Apollo 13 reminds us that science and technology are an essential part of the human adventure.

But science and technology are not just activities for astronauts and academics. They affect our lives every day and they create immense benefits and opportunities for all of us. Their progress over the past few decades has been as dramatic as the movie that Americans are flocking to see.

What are some of these benefits?

You would expect me, as a university president, to have a catechism to recite. But listen instead to what the CEOs of 16 major U.S. corporations said recently. In an unprecedented joint statement entitled, "A Moment of Truth for America," they said:

"Imagine life without polio vaccines and heart pacemakers. Or digital computers. Or municipal water purification systems. Or space-based weather forecasting. Or advanced cancer therapies. Or jet airliners. Or disease-resistant grains and vegetables. Or cardiopulmonary resuscitation." That, and much, much more, is what science and technology—and

our nation's universities—have made possible.

But today, rather than building upon this success, we are about to undermine it. The Congressional budget resolution proposes to reduce the budget for civilian research and development by over 30 percent. The outlook is no better in the Administration's new budget proposal. We live in an age in which knowledge holds the key to our security, welfare, and standard of living; an age in which technological leadership will determine who wins the next round of global competition, and the jobs and profits that come

from it; an age in which events move so rapidly that almost 80 percent of the computer industry's revenues come from products that did not even exist just two years ago.

The cornerstone of our era—the information age—is education. America's system of higher education and research is the best in the world. Period. But if the nation is to be preeminent a decade hence, if we are not only to compete but lead, then we must sustain these unique American institutions.

hat is so special about our research universities?

First, the weaving together of teaching and research in a single organization gives us excellent research, and it gives us superior education. Universities combine research and teaching to create vital learning communities—open communities of scholars that advance our understanding, and introduce fresh and innovative young minds into the creation of knowledge—thereby educating the next generation of scientists and engineers.

Second, research universities are the foundation of our entire national research infrastructure. Supporting the advancement of scientific and technical knowledge is an investment. It is an investment in the future of our human capital—people and their ideas. It is an investment in the future quality of life, health, and welfare of the American people.

This rationale was articulated 50 years ago this month in a report to President Truman entitled, *Science—The Endless Frontier*. It presented the vision of Vannevar Bush, who had directed the nation's wartime

Above all,
we must be guided
by the ideas that
research is an
investment, not a
cost, and that
combining graduate
education with
research makes
every dollar count
twice.

science effort. That vision set a confident America on a search for excellence. And America has benefited beyond measure from this quest.

Under current budget scenarios, however, we are in danger of disinvesting in our future. The cost of doing so, and of drifting toward mediocrity in science, technology, and advanced education, is simply too great to pay. We must regain our vision, our confidence, and our will to excel.

The Federal government is rightly concerned about the budget deficit. It is making hard choices. We all have to make hard choices. But these decisions have to be based on a vision of the future and on an understanding of what hangs in the balance.

Is a one-third reduction in civilian research and development really a savings? Or is it a body blow to our

national innovation system, our future competitiveness, and our leadership? In the current debate, many seem unwilling or unable to retain, let alone enhance, our national excellence in science and advanced education. Instead of pursuing our endless opportunities, we are in danger of drifting toward mediocrity. This need not be the case. It must not be the case.

It used to be that universities and the federal government—in the White House and on Capitol Hill, and the voting public—had a broadly shared sense of the benefits to be derived from investing in education and research and a shared commitment to the future. This commitment is rapidly fading. Although leaders in both parties and in both branches of government are struggling to retain it, it is fading. Today, the future has no organized political constituency.

Since the 1980s, when I began my career as a senior university administrator, I have seen an unraveling of a once fruitful partnership between universities and the government. Its fabric has been frayed by a steady onslaught of policy and budget instability, rule changes, investigations, and deepening distrust.

Congressional hearings and media exposés on the reimbursement of the costs of federally sponsored research have tarnished the image of universities. Most of the real issues have long since been addressed, but a residue of misunderstanding and cynicism remains. At the same time, the federal government has steadily asked the universities to take on added missions and requirements

without providing the resources to meet them. It is in this strained environment that the nation is now debating the future federal role and responsibility for university research and education in science and technology.

The issue before us transcends partisan politics. The issue is whether Washington budgeteers and decision-makers have the political will and the vision to serve society's long-term need for new knowledge, new technologies, and, above all, for superbly educated young men and women. Sometimes the debate sounds strange to the ears of this academic. During an important recent budget session, for example, a Congressman actually commented: "I don't give a damn about the science, but I sure love the politics!"

There are those of us who would like to see those sentiments reversed—this includes the American public. Recent polls show that nearly 70 percent of the American public thinks it is very important for the government to support research, and 9 out of 10 of those surveyed want the country to maintain its position as a leader in medical research. In fact, 73 percent are willing to pay higher taxes to support more medical research. What we need now is not a partisan political debate. What we need is to come together again in the best interests

Accompanying President Vest to Washington for the Press Club address were his wife, Rebecca (left), and two outstanding young MIT researchers: Jennifer Mills, '96, and James McLurkin,'95. of the next generation.

We are all facing pressures to cut costs and become more effective and efficient—in government, academia, and industry. Industry is doing its part, by producing better, more competitive products, by improving processes, reducing cycle times, improving quality, and meeting environmental challenges. The intense competitive pressures that stimulated these changes, however, have increasingly focused industrial R&D on short-term objectives. Appropriately so. But research of more general and longer term value has been scaled back tremendously.

Industry's nearly total R&D focus on rapidly commercializing products, when combined with growing constraints on support of university research, could devastate our national innovation system. It could well leave us without a shared, evolv-

ing base of new scientific knowledge and new technology. It could destroy the primary source of tomorrow's products, jobs, and health.

any Americans have long been concerned that we were mortgaging our children's future with everincreasing federal budget deficits. Rightly so. We must not, however, foreclose on their future by failing to invest in their education, and in the research that will be the basis of their progress. We must be wise enough to balance our priorities, with both the present and the future in mind. Such a balance clearly requires our research universities to transform with the times.

I certainly recognize this. Our unique qualities do not exempt us from change. We cannot expect a 1945 policy to be applied unchanged



in 1995. Nor can we expect to be exempted from intense budgetary pressures. But there are enduring principles that must be sustained. We must strike the right balance between holding to fundamentals and reforming ourselves if we are to continue our journey toward that "endless frontier."

Each member of the education and research partnership must learn how to be efficient, productive, and excellent. Industry has learned how to add value, improve quality, and become more cost effective—and is significantly more competitive as a result. Government is struggling to do the same. Research universities must follow suit.

At MIT, we have enlisted privatesector help to reengineer many of our administrative activities in order to improve our effectiveness and reduce our annual costs by \$40 million. There will be a corresponding reduction in our staff. Similar efforts are taking place at universities around the country. We also are exploring exciting ways to use new information technologies, like the World Wide Web, to improve teaching and learning. Radical revisions are well underway in our engineering and management curricula to meet the needs of a new era.

I believe that each college and university should focus on what it does best. There is not enough money for every institution to do everything. We need institutional differentiation. Each of us—from community colleges to research universities—must focus our attention on where we can make the greatest contribution. Across-the-board reductions may be politically palatable, but they are likely to produce mediocrity.

We need to make tough judgment calls and we need to support the most effective programs. This isn't easy. But government at all levels, and industry, must make the decision to support excellence—not to engage America's research universities in a war of attrition. Let's not do to our research universities what we've done to our K–12 school system.

Improving productivity and changing what needs to be changed are only partial answers to our problem. Even more important is adhering to the two basic principles that have guided us to success over the past half-century. The first principle must be this: research funding is an investment in our future. A variety of studies put the return on this investment in the range of 25 to 50 percent.

A more dramatic assessment is provided by my colleague Michael Dertouzos, who is the director of MIT's Laboratory for Computer Science. He points out that over the last three decades, the Department of Defense has funded university research in information technology to the tune of some \$5 billion. These university programs created onethird to one-half of the major breakthroughs in computer and communications companies. Today, these businesses account for \$500 billion of U.S. Gross Domestic Product. That is a return on the investment of at least 3,000 percent.

Another measure of return on the investment in university research is jobs. A 1989 study by the Bank of Boston found that MIT graduates and faculty alone had founded over 600 companies in Massachusetts. These companies, with annual sales

totaling \$40 billion, created jobs for over 300,000 people in the state. Similarly, the Chase Manhattan Bank identified 225 companies in the Silicon Valley founded by MIT students, alumni, and faculty. These companies have recorded revenues in excess of \$22 billion and account for over 150,000 jobs.

Similar stories can be told by public and private universities all across the country. Remember this return on investment when you hear talk about the cost of research and education in the national budget debate.

In the budget debate, it is important to remember a second principle that also has served us extremely well: federal dollars for university research do double duty. They support the conduct of research and they educate the next generation.

Here is how it works: Most graduate students in science and engineering are supported by federal grants and contracts that pay their tuition and enable them to attend the university. In return for this investment in their future, these students perform much of the actual research. And let me tell you, the lights in their laboratories burn late into the night.

Student involvement in research is not confined to the graduate level. At MIT, for example, nearly 80 percent of our undergraduates join faculty research teams at some time during their bachelor's-degree programs. Their learning experience and their substantive contributions to research are simply astounding.

This blending of teaching and research is at the heart of America's research universities. For when you think about it, research is the ultimate form of teaching and learning. Fred Termin, a great leader of Stan-

Nobel Prize winners and other top scientists have always cried doom when spending for science was cut—even when much smaller cuts were enacted in past years. Yet science survived. Why should we believe these cries of doom now?

Vest: Well, I believe that the cry of doom comes from facing a 30 percent reduction in real dollars by the year 2002. I don't believe that there has been any period in our postwar history in which we have seen a potential decline of that level. Now, I do not, as I tried to emphasize in the speech, believe that all of the research issues have to do with government budget cutting. There are changes that we in the universities have to carry out.

Nor do I believe that only "science" is at risk. There is another threat: In order to remain competitive in the world economy, our industries have had to—and I emphasize had to—transform their own R&D operations to focus on near-term matters. That leaves a gap in the mid-range research that straddles the bridge between fundamental new knowledge and new-product development. If funding continues to drop, that work could disappear, and that really is the source of the nation's innovation.

Some voices in Congress are advocating that federal funds should support only basic research, not applied. Is this a good idea?

Vest: My view is that the political tendency to define and box research under certain labels has not been helpful. In the Congress, in just two years, we've moved away from an emphasis on "strategic" research—research with likely application to the commercial world in the near future—and now we are talking about basic research.

Research today is a continuum. It really cannot be divided into nice, neat chunks. I think it is extremely important that in our universities, we engage in research that is important in the fields of engineering and technology, as well as those in very fundamental science. Certainly the first goal of universities must be to retain strength in the most fundamental development of knowledge. But it is also extremely important that we educate engineers and at least a portion of our scientists in ways that are relevant to the world of industry where many of them will be working. And that also entails an investment in engineering research.

Q: University researchers are typically funded by the federal government. Yet when scientific researchers patent a scientific process or start a new technology-based com-



pany, the government does not share in the financial rewards that go to the re-searcher and the university. Is this fair to the taxpayer?

Vest: While universities, including MIT, do receive modest benefits from a number of patents, I believe that the number of university patents that have resulted in substantial benefits to universities is so small you could probably count them on one hand. It is also worth noting that, at least at MIT, the government has free use of any patented invention that stems from federally funded research. There is a much more important point, however, behind the the present policy, whereby universities retain rights to the patents developed under federal funding: Once the universities began to have control over and reponsibility for the patents, the amount of commercialization of these new ideas rose dramatically. This policy, which is embodied in the Bayh-Dole amendment, has sparked the entrepreneurial system and resulted in vastly more new products being developed from patents.

Q: When the federal budget is being contracted, why can't money for research come from private industry or foundations?

Vest: At MIT right now, our research funding is 80 percent federal, and 20 percent by private corporations. While we do work to establish more collaborations with industry, it is not realistic to expect that corporate support of university research will be able to replace 30 percent of the federal allocation. Why not? Because the return on investment in mid- to long-term research does not accrue wholly, or sometimes even in large measure, to the organization that sponsored the work. University research is more likely to generate a lot of ideas that help the whole system rise, as opposed to dramatic profits for one company. If corporate support for our universities does increase, it will be in large measure because our educational as well as research programs, particularly in engineering, management, and some areas of science, are going to be more oriented toward the evolving needs of industry.

O: Do you feel that too much emphasis was put on research and not enough on teaching while you were at MIT?

Jennifer Mills, '95: No, not at all. All of the major classes that I took as an undergraduate were taught by professors. None, except for small recitation sections, were taught by graduate students. And I thought that was wonderful. I hear from my friends at other colleges that things like that are not happening there.

James McLurkin, '95: There is a lot of emphasis on teaching, but what makes it so special at MIT is that the people who are teaching us are world-class researchers. You get your share of professors who aren't very good at teaching, but they're still world-class researchers. You can ask them a random question about anything, and they've got an answer for you. You can go see their labs, you can look at their research and get involved in their work—even as an undergraduate. And that has much more value than a really good lecture. That's learning, where you're asking the questions and looking for the answers at the same time.

Vest: I want to close those wonderful student answers with one caveat: one of the reasons for the high level of tuition at a private institution like MIT is that we maintain a very high ratio of faculty to students; we are able to place great emphasis on teaching by our faculty.

: THE INFAMOUS FINAL QUESTION: Is it true that MIT has more sports programs than any other university, but that engineers are afraid to play tackle football?

Vest: We believe that MIT fields more varsity teams than any other institution in the United States. The only person who ever disputes that statement is my colleague Tom Everhart, president of Caltech. Having said that, we most assuredly do play tackle football. I refer you to a remarkable article on our football team published a few years ago in Sports Illustrated that is best known for a quote from our coach, who said, "The interesting thing about coaching football at MIT is that you can't really tell when the players have been up studying all night, but if they've been up two nights in a row, you can usually tell."

ford University, and a driver in the creation of Silicon Valley, was once asked whether he wanted his university to emphasize teaching or research. Termin's reply was, "I want this to be a learning university." He captured the essence of our institutions.

Now, however, this integration of teaching and research is at risk because government agencies are paying less and less of the costs of research they sponsor. In order to make up the difference, universities are being forced to tap scarce resources that are not intended for this purpose. This creates enormous pressures to increase tuition-precisely what we do not want to do. In addition, government regulations are increasing, in both magnitude and inflexibility. The latest federal regulations, for example, have boosted the cost of our undergraduate research program so dramatically that this innovative educational experience is in jeopardy.

The linkage between education and research, the idea of research as an investment rather than as a cost—these are vital principles which we neglect at our peril.

here are several other principles as well, including accountability for results in research and education; a commitment to access and opportunity; the free and open competition of ideas; and a total dedication to excellence. Those young people with the talent to discover new sources of energy, to unlock the workings of the mind, or to find the cure for AIDS, come from all strata of our society. Many require financial assistance. All deserve access to the best education we can provide because all of us will depend on their leadership and their innovation in the decades ahead.

Who are these young people who will lead us into the future? Let me introduce two of them from MIT.

First, meet Jennifer Mills. Jennifer is a physics undergraduate from Portland, Ore. Last summer, following her junior year, she wrote much of the computer code that was used to produce the remarkable images from the Hubble Space Telescope that we all saw on television when the Shoemaker/Levy comet collided with the planet Jupiter.

And meet James McLurkin, from Baldwin, N.Y. James graduated last month with an undergraduate degree in electrical engineering and a minor in mechanical engineering. As a senior, he created a tiny robot that may well revolutionize certain kinds of surgery, enabling surgeons, for example, to operate inside the body without touching the patient directly.

These are the kinds of young men and women in whom we, through the Federal government, must invest if we are to embrace excellence rather than mediocrity. Unfortunately, no organized political constituency protects the interests of our future. No interest groups fund telephone banks and direct-mail operations to activate voters on behalf of investments in tomorrow. No political-action committee invests in students like Jennifer or James.

But every citizen will suffer if we are short-sighted in the allocation of resources. If we do not invest in research and advanced education, we will not win the battles against polluted air and water, crumbling bridges and highways, infant mortality, and Alzheimer's disease, and hunger in the world, to name just a few.

We all have the responsibility to become trustees and guardians of our future and the future of our daughters and sons:

- •University faculty must continually enhance the learning process, and we must do a better job of explaining to the public what we do, why we do it, and how it relates to the values and needs of society at large.
- •Industry leaders need to explain the benefits to the economy of research and development as well as their own responsibilities to the entire national innovation system.
- Public policy makers need to take the long view—and they will do that if we, the public, insist that they do.
- •And, yes, the media have a critical role to play, by discussing the importance of these issues and by elevating the national debate.

In many ways, it has been the end of the Cold War that has brought us to this point—a point of uncertainty and opportunity. We now must have the foresight and wisdom to turn our intellectual powers to solving the problems of a new age. We must have the will to sustain our economic security, eradicate the scourge of disease, create the jobs of tomorrow, lift the shadow of ignorance, and heal the earth's environment.

Meeting these challenges will require vision, confidence, and the will to excel. And it will require us to continue exploring the frontiers of the unknown. For the key to a vibrant future lies more in what we do not know than in what we do know.

That is why we must sustain excellence in research and advanced education. □

## **Investing for (and in) the Future**

IT graduates are a generous lot. For the year ending in June 1995, we set a new record in the number of donors to the MIT Alumni/ae Fund: a total of 29,817 out of the 78,900 grads for whom we had known addresses gave to MIT. That works out to about 38 percent. The previous participation record of 29,132 donors was set in 1989.

MIT's participation rate for undergraduate alumni/ae alone (43 percent in 1995, 42 percent in 1994) is below Princeton (more than 56 percent), Harvard (53 percent), and Dartmouth (51 percent), but above Yale (35 percent), Brown (36 percent) and Stanford (30 percent)

percent).

Particularly impressive in fiscal '95 was the fact that first-time donors totalled 2,266; it was the first time that figure has gone over 2,000. The previous record was just under 2,000 in 1982.

Total giving looked good as well, coming in at \$21.3 million. (The all-time record Fund of \$23 million was set in 1994.) Nearly half of all the alumni/ae contributions came in at \$100 or more. (I should note that among the very largest gifts from alums, only the first \$100,000 are credited to the Fund.)

The higher number of donors last year was no accident: Although dollars are always vital, the Fund Board made a conscious decision for 1995 to emphasize greater participation, setting a target of 29,000 donors. Volunteer fund-raisers and staff pushed hard to achieve the goals, and alumni/ae responded.

Most of you have been asked to give to MIT—and possibly to other schools as well. Many of you have undoubtedly responded with a check, perhaps out of a sense of obligation, perhaps out of a sense of gratitude. But you may not realize that alumni/ae giving—and income on gifts—has played an important role in funding U.S. colleges and universities. That role is likely to become even more important than ever as government funding shrinks and as the number of students requiring financial aid continues to grow.

A good deal of alumni/ae giving at MIT goes into the annual budget, to



help pay faculty salaries, student aid, and other immediate needs. But part of this gift stream is directed into permanent endowment, which provides a source of continuing income. In recent years, for example, MIT grads have poured between \$1 and \$2 million annually into scholarship funds, career development professorships, and other class projects. There are now 69 classes supporting 88 class-project funds whose value totals more than \$30 million.

For many colleges and universities, income earned on endowment provides a substantial part of operating budgets. According to Moody's Investors Service, about 45 schools draw more than 5 percent of their operating budgets from their investment income, with a handful of schools drawing considerably more. Swarthmore, for example, is up at 31 percent, and Harvard and Williams are both over 20 percent. Princeton, Wellesley, Amherst, and Smith are all over 15 percent.

MIT, with a \$2.1 billion endowment and an operating budget of about \$1.1 billion, draws about 10 percent of its operating budget from investment income. If Lincoln Laboratory is excluded from the calculations, the portion of the operating budget drawn from investment income is about 13 percent.

Few of these schools make all of their earnings on endowment available for

current spending. Most of them, including MIT, direct some of their investment earnings back into the fund in an effort to ensure against erosion by inflation and to maintain purchasing power. In very good years, reinvested income may expand the endowment fund.

Over the past 20 years, 1974–94, MIT's investment earnings have been strong enough to hold the real value of the endowment constant, even with inflation averaging about 5.6 percent per year and with MIT spending from endowment running at about 4.7 percent annually.

The relative importance of that endowment-income stream as a proportion of MIT's overall budget has varied widely. In the 1960s, for example, government funding for research expanded rapidly, and endowment provided a smaller share of the pie. In the last decade, however, its role began to grow. Between 1984 and 1994, the amount that MIT drew from its investment income to meet general expenses grew at an annual compounded rate of about 9 percent—the highest rate of any of MIT's sources of revenue. During those same years tuition revenue rose at 7 percent, research funding increased at 5.6 percent growth, and gifts rose at about 6.5 percent.

And in the next decade, the role of endowment income will very likely continue to grow. As I write, Congress is in the process of further cutting funding for research and education, and universities like MIT are under tremendous pressure to hold down increases in tuition. Although major efforts are also underway to win increased support from industry to help fill the gaps, your alumni/ae contributions and income on the endowment they support will be more essential than ever.

Karen arenson

KAREN WATTEL ARENSON, '70 President, Association of Alumni and Alumnae of MIT; 125 W. 76th St., Apt. 2A, NY, NY 10023; e-mail: <Arenson@NYTimes.Com> or <DHBM13D.Prodigy.Com>

# ClassNotes

Please send news for this column to:

Bob O'Brien, acting secretary
25 Keith Rd.
Pocasset, MA 02559

Please send news for this column to:
D.P. Severance, '38, acting secretary, 7 River Woods Dr.,
F219, Exeter, NH 03833

Please send news for this column to: Class Notes Editor Technology Review MIT W59-200, 77 Mass. Ave. Cambridge, MA 02139

Please send news for this column to:
Bill Langille, secretary
20 Rogers Rd.
Far Hill, NJ 07931

Now that our longtime friends, the Bugbee twins, Perk and Harold, who successively and successfully handled 1920 Class Notes have both passed away leaving no classmate to maintain this column, we have asked the editors for permission to write the obituary of another good 1920 friend whose

death notice was sent to us for use in the 1921 notes.

Edwin Delamater Ryer, electrical engineering, died on March 9, 1995, in his Duxbury, Mass., home at age 97, according to the Cam-

bridge Chronicle.

Pete, as he was known to close friends, was VP of Barbour Stockwell Co., a Cambridge

Pete Ryer

Co., a Cambridge heavy equipment manufacturer, for many years prior to retirement in 1957. A World War I Army veteran, he also was a former commodore of the Duxbury Yacht Club.

He was active in many undergraduate organizations at MIT—a member of Delta Kappa Epsilon, Osiris, Beaver Club,

Theta Tau, Masque, Walker Club, and the Electrical Engineering Society.

A tough competitor for 1920, he won MIT numerals early as captain of freshman and

sophomore tug-o'-war teams, where we first met him.

Pete was selected to serve on the Institute Committee and his fellow students in the Class of 1920 elected him as class VP. They also voted him as "Most Popular" and "Most Likely to Succeed" in a poll for *Technique*.

As an alumnus, MIT honored him with election to the Corporation from 1952 to 1959 and the Alumni/ae Association made him chairman of the board, MIT Alumni/ae Fund.

Pete is survived by a daughter-in-law, Jane Ryer, and two granddaughters. Jane writes, "Ed was a wonderful friend to me and a great teacher. My life has grown due to his love and great understanding, teaching, and support." He gave much to his grandchildren as well. Vicki is graduating from Bard College in New York, and Scotia is a junior at Northwestern, where she is captain of the sailing team.—Carole A. Clarke, president, MIT Class of 1921, and self-appointed secretary pro tem, MIT Class of 1920, 608 Union Ln., Brielle, NJ 08730-1423; tel: (908) 528-8881

**75**th Reunion

Coincidence: Just as we decided to phone William J. Sherry, chemical engineering, our class VP living in Tulsa, Okla., to discuss how best to promote attendance at the class table for our 75th Reunion during the luncheon on Technology Day in early June 1996, we received a highly appreciated but sorrowful letter from Robert L. Rorschach, 1943 class secretary, also living in Tulsa, telling us that Bill is in a local special-care facility.

Our phone call to Bill's wife, Margaret, disclosed that, at 96, he has had a couple of falls with no serious injuries and has some hearing loss. We sincerely hope that Bill soon will be home in fine fettle, preparing for the trip back to Tech, if that is compatible with his health.

Bob also tells us that Bill is a longtime friend who was on the Educational Council to interview Bob for admission to MIT—as well as two brothers and a son.

In addition to Bill's successes in forming and operating the Sherry Oil Co. for many years, Bob lauds his highly successful career up to retirement, not only as an independent oil production developer but also as a facilitator for numerous oil industry negotiations to the point of becoming an eminent consultant in that field.

He tells us that Bill was on speaking terms with virtually all of the famous persons active in the petroleum industry since the 1920s.

Besides admissions activities, Bill has generously supported MIT's Alumni/ae Fund and served as a fund-raiser. In recognition of his services, he was honored with election as a term member of the MIT Corporation and was further honored with MIT's top award of

the Bronze Beaver—as were the two other class officers, the assistant secretary and the president who received one of the first two Bronze Beavers at the initial award ceremonies in 1955. Thank you, Bob, for a grand letter and warm, helpful consideration.

Sumner Hayward, chemical engineering, class secretary-treasurer emeritus, reports that he was the sole 1921 representative at the annual dinner of the Supporting Fellows of MIT, held in Combridge.

MIT, held in Cambridge.

We have had the unique new experience in being the recipient of a bequest from the late Monroe C. Hawes, chemical engineering, and the late Alex Hawes, his wife. Alex's sister, Mrs. Jewette Peters asked if we had received the MIT book held for us. On being told we had not, she arranged for the Hawes' eldest daughter, Mrs. Aimee Ferguson, to hand deliver a handsome album filled with group pictures of '21ers at our 50th Reunion. If you are in our neighborhood, phone first to be sure we're here and come see it!

Speaking of reunions, will you kindly volunteer to be a "greeter" for our 75th Reunion luncheon early next June 1996, at the MIT luncheon for all classes to be held during Technology Week in Cambridge?

It will be a lot of fun and we know you'll meet fellows you haven't seen for a long time. Of course, your family members and other guests are invited to join us on a very happy occasion.

Please use a letter, postcard, or phone call to tell us you will be there to enjoy good food and good company!—Carole A. Clarke, president and secretary, 608 Union Ln., Brielle, NJ 08730-1423; tel: (908) 528-8881.

Before going to press, we learned of the passing of Samuel Lunden. A full report and tribute will appear in the next issue. —Ed.

Please send news for this column to: Class Notes Editor Technology Review MIT W59-200, 77 Mass. Ave. Cambridge, MA 02139

I retired from the business world in 1972, but I will never be able to retire from my duties to the Class of '23. I am president, secretary, treasurer, and class agent. I have chaired

the last four reunions and hope I will be able to be there for the 75th. I will be 95 years old on the 26th of September. It helps to live in a posh life-care community for I am able to use an electric cart to get from my apartment to the dining room and to my parking space. Yes, I am still driving almost every day, lucky me!

I have two deaths to report. . . . William S. LaLonde, Jr., a man of many accomplishments, passed away May 27. He lived in the

same life-care community that I live in. He and Marion attended most of our reunions. He is survived by his wife, Marion, a daughter, Marilyn Boyle of Fort Pierce, Fla., and a son, William S. LaLonde III.

Edward H. Clendenin passed away October 17, 1993. He received an SB in business and engineering administration. He joined the oil industry with Standard Oil Development Co. and the Esso Research and Engineering Co. He had numerous projects and his engineering work took him all over the world.

Send news to: Royal Sterling, secretary, 2350 Indian Creek Blvd., W., Apt. D-201, Vero Beach, FL 32966

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First I must apologize for missing several columns. In March I was flooded out of my home. Although a friend set up my computer in their home it has taken me this long

to get myself together. It is like living two lives—one in town (Carmel) and another up the valley at the Hacienda. I seem to have obligations in two places, frequently conflicting. Thus I hope you will understand.

This delay has some good features. I have had three nice notes. Blanchard Warren in Oregon reminds us that he graduated 70 years ago. At age 12 he had promised himself that he would see in the year 2000. He will then be 100 years old.

Phil Blanchard in Florida says this column is often lacking in news. While he and his wife are 95, he cannot tell of their demise, yet. He

suggests that some humor of bygone days at MIT in the 1920s be added to the column and offers the following:

From a coed: "Love me, love my dog,' she said. And so he began loving ToTo too." And from the first anti-smoking crusader: "Lips that touch the vile cheroot, shall never rest beneath my snoot." On the more serious side he comments that he has not heard of an election of officers so—"I assume Dick Shea has volunteered to carry on for what's left of us." He parts with this, "I'm a rambling wreck from Boston Tech, and a has-been engineer."

Lafayette Quirin in Florida says that he and Etiennette are enjoying their eighth year at the Harbour's Edge retirement home. They especially enjoyed the holiday of December 1994 when son, Pierre, had come from Wellesley to be with them.

We must take the bitter with the sweet. I regret to inform the class that William Leonard Rowe passed away February 13, 1994, at age 90. He was living in Sarasota, Fla., and was retired from Johns-Manville Products Corp. He is survived by his wife, Elizabeth.

Raymond Paul Schreiber, Sr., died December 3, 1994, in Sun City Center, Fla. He was retired from Dow Corning Corp., where he worked as a chemical engineer in sales. He worked for the Midland Chamber of Commerce. He also served the Boy Scouts of America for 57 years and was awarded the Silver Beaver. In Sun City Center, he was a member of the Chamber of Commerce, the Kiwanis, the Investment Club, and the United Community Church. He is survived by his wife, two

ecil Green, '23, and Jodie Ray, '67 (lower right), at a dinner party in March organized by MTT Club of Dallas/Ft. Worth members Mark Montaniel, SM '74, Mark Thome-Thomsen, '76, and Gurumurthy Kalyanaram, PhD '89 (upper left, with Green and Club President Don Wolman, '71).



The gathering of 25 alums and their guests met with distinguished alumnus Cecil Green, founder of Texas Instruments, at the Bombay Cricket Club Restaurant in Dallas. Green, wear-

ing his official MIT tie, delighted them with his wit when asked when he would like to address the group— "I'll just speak at the most inconvenient time"—and fascinating tales of his life through this century. Having survived the San Francisco

earthquake in 1906, he studied at the University of British Columbia and MIT and then worked at various GE facilities. He described how he learned of the invention of the transitor and immediately saw potential application for it. He also spoke of his beloved wife, Ida, and his association with many other people through the years.

Anticipating Green's 95th birthday in the summer, the group celebrated with birthday cake and candles.

## ClassNotes

sons, three daughters, two brothers, eleven grandhoildren, and five great-grandchildren. Condolences to all the family.

Paul Schreiber has bequeathed in his will a donation to MIT. That is very generous of him. John B. Lewis passed away December 17,

1994. He was living in Hightstown, N.J., at the time. He is survived by his wife.

Robert O. Dehlendorf died January 31, 1995, at age 94. He had been ill for some time and had been a resident of Menlo Park, Calif. Robert attended the United States Naval Academy before MIT. He worked for General Motors Corp. in Dayton, Ohio, retiring in 1966. He is survived by his wife, Louise, three sons, seven grandchildren, and four greatgrandchildren.—Co-secretaries: Katty Hereford, 237 Hacienda Carmel, Carmel, CA 93923; Col. I. Henry Stern, 2840 S. Ocean, #514, Palm Beach, FL 33480

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Three days ago, June 16, our 70th Reunion became history. Eight classmates made an appearance with a good number of guests. The attendees are listed as follows: Court

Worthington and Margaret; Don Taber and Wilmina; Ed Harris and Mary from Virginia; Stanley Lane and Grace with five family members as guests from New Hampshire; and Milt Salzman from Long Island. Art Odegard and his wife from Florida just made the luncheon program. Evelyn and I made the Friday program with our daughter-in-law Helen and grandson David providing some much needed transportation from Cape Cod.

Before the Pops Concert on Thursday night, there was a class business meeting at which it was voted that the officers be reelected. For the record those elected are president, Court Worthington; VP, Don Taber; class agent, Sam Spiker, and yours truly as secretary. Let me remind all classmates I need your help to make the Class Notes newsy. At the luncheon on Friday, reunion class gifts were announced and Sam Spiker had the pleasure of announcing our 70th Reunion Class Gift that was in excess of \$1,800,000 with 90 percent participation.

Some of the gloss of a successful reunion class comes with the need to report the passing of two classmates.

Belatedly word reaches us that Gilbert Noble died on July 10, 1993, in Winter Park, Fla. Gil received an SB in geology and an SM in mining. After a few years, he returned to earn an ScD in mining engineering. He retired about 1960 from the Research Department of Ohio Oil Co. where he was a staff member. He then moved to Winter Park, Fla., where for several years he raised horses.

Henry D. Bevan died on November 19, 1994, in Swarthmore, Pa. Little information is available regarding Bev. As a mechanical engineer, he worked in the Philadelphia area throughout his career. He lived in Philadelphia until 1942 when he moved to Swarthmore and became a commuter.—F. Leroy "Doc" Foster, secretary, 434 Old Comers Rd., P.O. Box 331, N. Chatham, MA 02650

70th Reunion
Please send news for this column to: Donald S. Cunningham, secretary, c/o Ronald F.
Frazier, 132 Middle St., Braintree, MA 02184

Please send news for this column to: Joseph C. Burley, secretary, Isle of Springs, ME 04549; Lawrence B. Grew, assistant secretary, 21 Yowago Ave., Branford, CT 06405

All those of our Class of 1928 are treasured friends and classmates but there is occasionally one who, because of outstanding dedication and effort in the activities in our alumni/ae years, deserves special recognition in his or her passing from the active scene. Such is the case

with Abraham Woolf, who died on May 9,

1995, in Boston, Massachusetts.

The accomplishments of Abe have been wholehearted and have been appreciated through the years, not only by our class of 1928 but in the MIT community for which he did so much. Lacking the specifics of that background, I will hope for more complete data at a future date. The noteworthy success of many of our reunions can be credited to Abe and we will miss his enthusiasm.

We also regret announcements of the deaths

of other classmates. Roberta Bernice (Lovely) Halligan passed away on April 5, 1995, in West Orange, N.J. Roberta, since her graduation, has worked in public health in many capacities and during World War II in civil defense and Red Cross. . . . Notice of the death of Morris Herman Klegerman has been received but without the date or place of death. . . . And we have delayed notice of the death of John William Johnson on December 21, 1993, in Lake Worth, Fla. We feel the loss of these friends and express condolences to their families.—Ernest H. Knight, secretary and president, 168 Ai Plummer Rd., Raymond, ME 04071

Please send news for this column to: Class Notes Editor Technology Review MIT W59-200, 77 Mass. Ave. Cambridge, MA 02139

One of the most important ingredients of a successful reunion is good weather, and our 65th hit the jackpot in this respect; our June days in Cambridge were indeed "rare." Some 13 classmates, 7 wives, a son, and a daughter attended one or more of the scheduled events. Lorinda Burling, who is now a grandmother, accompanied her father to the

class dinner on Wednesday and Stewart Wil-

son, '60, joined his father at the Technology

Day luncheon. If you would like a complete

list of the participants, let me know.

The class dinner, which was at the Faculty Club this year, is traditionally the occasion for a business meeting at which class officers make their reports and an election is held. Normally the class president appoints a nominating committee to name a slate of candidates for submission at the meeting, but since our class president Ed Prichard died last year, an innovative procedure was required. In the event, Yicka Herbert, Jack Latham, and I appointed ourselves as members of the nominating committee and then nominated ourselves as class officers. Jack will be class president for the next five years, Yicka will continue as VP and treasurer, and I will continue as secretary. Also Dick Wilson has agreed to be 2nd VP.

After the election of officers, Yicka reported that the class treasury is in a healthy condition and I reported that class of '30 Notes have appeared in each of the 40 issues of the Review since the last reunion.

Prior to the reunion I had compiled some vital statistics for presentation. During the past five years 72 more classmates have died. Of the 456 classmates pictured in the 1930 *Technique*, 100 are still living, which works out to 22 percent. Of the 406 who actually received SB degrees in 1930 there are 107 survivors, i.e., 26 percent. It appears that about 1/4 of our graduating class is still living.

Our oldest survivor is Joe Kania of Vancouver, B.C., who was born in 1901. Runners-up are Bill Howe and Irving Dow, born in 1903. Our youngest survivor is Sol Uman, born in August 1910 and thus 19 at graduation. Run-

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\*Please note that if there is an MIT Club in your area, you will need to be a current member of it in order to join the Princeton Club

ners-up are Win Hartford (June 1910) and Paul Wang (February 1910).

The record for distance traveled to the reunion goes to Margaret and Paul Wang who live in Orange County, Calif. Paul still does some work for the county government. He says that in spite of the huge financial losses Orange County has sustained in recent years, he still gets paid regularly for his work.

On Thursday we joined members of the class of '35 on a pleasant cruise up the Charles River, followed by a luncheon at the Science Museum. On Thursday evening we attended the traditional "MIT at the Pops" concert at Symphony Hall. As you may have read in the papers, the Boston Pops now has a handsome young conductor named Keith Lockhart, who arranged a superb program for us. In general the program was characterized by a patriotic theme and at several points by enthusiastic audience participation. In my opinion, shared by quite a few others, it was the best Pops Concert we have attended.

At the concert I had a chance to chat with the third of the four Joseph Harringtons to graduate from MIT. Joe III, '61, has just been appointed assistant dean for development of the MIT School of Engineering, an appointment that would have greatly pleased our Har-

rington classmate. On Friday morning we enjoyed a program at the Kresge Auditorium on various aspects of MIT's contribution to the winning of World War II, which, together with the Technology Day luncheon, is reported on pp. MIT 1-9 of this Review. The final event of our class program was a Friday night dinner at Maison Robert, an excellent French restaurant in downtown Boston. At this dinner we were joined by Jack Latham's new wife, Charlotte, Joe Collins, Director of the Alumni/ae Fund, and two young staff members. (We received excellent support from the Alumni/ae Associaion staff throughout the reunion.) The invocation at this dinner was given by Vince Thormin, who is one of our two surviving clergymen and lives in Calgary, Alberta.

As a class secretary, I was particularly interested in touching base with other secretaries and managed to have brief chats with Leroy Foster, '25, Joe Burley, '27, Allan Mowatt, '35, and Charlie King, '41. Leroy "Doc" Foster has the distinction of having completed 50 years as secretary of the class of '25, a record that I can match only by surviving to age 101. Most of those attending our 65th are eagerly looking forward to our 70th in June of the year 2000.—Gordon K. Lister, secretary, Apt. 40, 5707 Williamsburg Landing Dr., Williamsburg, VA 23185

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## **65th Reunion**

Please send news for this column to: **Wyman P. Boynton**, secretary, 668 Middle St., Portsmouth, NH 03801

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Technology Day was a beautiful day. The featured speakers were most interesting. The luncheon was good enough! Our classmates in attendance were as follows: Don Brook-

field, John Brown, William Bannon, Wendell Bearce, Melvin Castleman, Arthur Marshall, Al O'Neill, and Tom Weston. Trudie Gowen attended the Pops concert. A class meeting was held at 2:30 p.m. where we began talking about our 65th Reunion. We gave some thought to our classmates that were reported deceased from March 26, 1994, to April 1, 1995. The morning memorial service listed the following: Philip M. Allen, Alexander J. Chaplik, Albert W. Dunning, Sidney M. Edelstein, Charles H. Fischer, Henry Fisher, John W. Flatley, Thomas G. Hannafin, Frederick R. Henderson, Everett B. Hulsebus, Campbell C. Hyatt, Jr., Dan M. Kentro, Charles B. McCov, Robert K. Mueller, George W. Muller, Ir., Joseph C. Noyes, Jr., Louis C. Raymond, Winthrop E. Robinson, Mary B. Scott, and John Zouck. Tom Weston gave us a report on our mini class reunion held in Hawaii and hosted by Savina and Manley St. Dennis.

Al O'Neil brought to our attention that his friend and our classmate Herman G. Protze died of cancer in May. He was an internationally known engineer. In 1934, Mr. Protze was a control engineer for Thompson and Lichtner, in charge of Cape Cod highway bridges. In 1948 he started his own company, H.G. Protze, Inc., in Newton. He sold the company, which was renamed Trow-Protze by its new owners, in 1989, but remained as a senior consultant. Herman served as an engineer consultant on a number of projects including The National Shrine in Washington, Boston City Hall, Boston Architectural Center, State Street Bank, Travelers Insurance Building, and Lincoln Center. He also worked in many countries including Bermuda, Jamaica, Korea, Taiwan, and Puerto Rico. He leaves his wife, Laura, one son, three daughters, ten grandchildren, and several great-grandchildren.

Colonel Latimer William Glowa received an award from the president of the Armed Forces Communications and Electronics Association for his long period of activity in the association. His recent assignment was as the executive secretary of the National ELINT Group (NEG), organized by the Secretary of Defense to coordinate ELINT activities for the government. . . . I received a very heartwarming letter from Don Gilman's wife, Doris. She recalled her pleasant experiences at our 60th Reunion with old and new friends. She writes, "Last December, I moved into a very small retirement home here in town. We have 19 residents and all are on a first-name basis-from the cooks to the director, so it is like home. I decided to dispose of my belongings myself and save my children a bit of trouble and have not regretted it. My daughter runs a bookstore in Springfield, Mass., and my son and his family are in New Zealand where they now, after 10 years, have dual citizenship. P.S. I now have a Chinese granddaughter-in-law after years of having five wonderful grandsons!"

That's all for now.—Melvin Castleman, secretary, 163 Beach Bluff Ave., Swampscott, MA 01907

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Each year attending the annual reunion it becomes more apparent that MIT "never promised us a rose garden." The great range of speakers on Technology Day in the

Kresge Auditorium (lacking greenery or exter-

## **ClassNotes**

nal shade of any sort) presented us with MIT's contributions to the winning of World War II. More than that it became evident that MIT was positioning itself as an international university not alone in technological advances but in matters leading to a better understanding of America's role in international ethics as well. Out of the prevalent political jungle there is reason to believe that peace for all mankind may come about due to the incremental probing of our higher institutions of learning. Towards furthering that effort, it was revealed to those of us at the 62nd Reunion dinner in the Grier Room that our Class of 1933 has two accounts each of which annually grants three scholarships in the amount of five percent of the market value of each. There is the Class of 1933 Robert M. Kimball Fund with a present market value of \$373,030 and the Class of 1933 Scholarship (from the 25th Reunion gift) with a present market value of \$361,849. This surprising information came to us from Betsy Millard of the Office of Memorial Gifts who spoke to us at the business portion of the dinner/meeting. Wonderful news, wonderfully presented!

Mrs. Millard now believes a new fund can be established by adding on to the original Class of 1933 Scholarship. These scholarships will be awarded through the scholarship arm of the Memorial Gifts Office.

Robert Kimball was a business and engineering (Course XV) graduate who held many administrative posts at MIT after graduation. He was associate director of the Los Alamos Scientific Laboratory and served in WWII with the Air Force and in the Navy Meteorological Service. Kimball was secretary to the MIT Corporation. He married Barbara Playfair in 1933 and they had five children. He exemplified the gratitude we all feel towards MIT by establishing a fund that not only honors him but a very grateful class as well.

Returning to our 62nd Reunion, it seemed the common thread that binds us to MIT grew even stronger as we commingled at the events for all classes. It was extremely gratifying that we met for the first time several people with credentials and careers exemplary even beyond most MIT personalities. I refer to the charm that Edward R. Atkinson and Harry G. Steinman lent to the proceedings. No real surprises as to the other attendees: Wilber Huston (president), Leonard Julian (VP) and wife Doris, Werner Bachli (treasurer) and wife Jeannette, Edward Simpson (assistant secretary) and wife Ida, Meyer Shnitzler and guest, Selma Goldberg. I am pleased to say that we were a closely knit group eager to advance our Class of 1933 interests.

Although George Ropes was to have attended the Tech Day luncheon, inexplicably he did not show, but where were the rest of you, as well? William A. Gray would have liked to come. He earlier wrote that he and his wife, Nancy, were contemplating a move to a retirement community known locally as "God's Waiting Room." Bill sends a note saying that they are now ensconced in their "Golden Ghetto, which puts up a lot of old people for a big fee ... but the alternatives are limited." Bill

reminds me that Boston's English H.S. 1929 graduation class consisted of 10 who had survived up to our 60th Reunion. He lists Adelson, Bloom, Gray, Kaplan, Liberfard, Nedbar, Payzant, Rand, Reisman, and Rubin. He says there may have been more, and indeed Levon J. Karaian was also there at the time. Bill includes a copy of a newspaper item on the Class of 1929 graduation of English H.S. (in his mother's possession for all her living years) revealing that William A. Gray was one of two recipients of the English/Latin/Commerce (H.S.) Scholarship and one of the awards of the Franklin medal as well. I report most of the above through no admission of Bill Gray, but why hide these superior achievements?

Although the Alumni/ae Association officially records the passing of Winthrop A.

Conant, a non-degreed Course VI, I am unable to add anything but the date (April 5, 1995) and that he once was with Dynage, Inc., of East Hartford, Conn. Although his daughter reported his death, nothing else of Winthrop Conant is known. Although much is left out, the following notes convey my real sorrow for the passing of one with whom I had daily contact over six years of our young lives, before and at MIT, seeking a bachelor's degree in architecture.

Thomas Kevin Fitzpatrick passed on February 22, 1995. Tom was one of the most cerebral in our graduating class of a scant 22 individuals. Setting himself apart from the rest of us, his bachelor's thesis was not a drawing but the "Organization of a Course of Study for the Relating of Construction and Architectural Design." Of course this influenced many architectural schools to seek his services in establishing changes to their present curricula. Tom went on to receive a master's degree in 1935. He served Clemson and Rice Universities, Iowa State College as a professor, and in 1954 he became dean of the School of Architecture at the University of Virginia. His son, Kevin Fitzpatrick (by his first wife, Beverly Trosdal, whom he married in 1941) wrote me quite lovingly of his father's many associated architectural achievements and honors. Among them, he was president of the Association of Collegiate Schools of Architecture and of the National Council of Architectural Registration Boards. Serving in Virginia as president of the Virginia Chapter of the American Institute of Architects, he was elevated to the College of Fellows of that renowned Institute. As anyone can imagine, Thomas Kevin had little time for family, but son Kevin fondly recalls the summer of 1960 when he, his mother, and our Tom were in Europe, where Tom was researching a forthcoming book, Rehabilitation Programs and Facilities of Western Europe. This extensive travel time was afforded them through a grant from the Department of Health, Education, and Welfare. Breaking away from academic ties in the mid 1960s and settling in Savannah to care for his wife's mother, he began an independent practice there and in Highlands, N.C., where he had practiced while teaching at Clemson University. Three grievous years after the death of his first wife in 1980, Tom married Jane (his surviving widow) in 1983. I had the pleasure of meeting her with Tom at our 60th

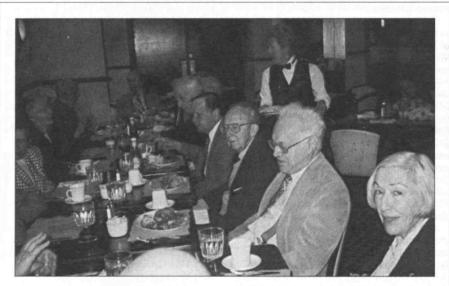
The passing of George Parmakian on May 14, 1995, is noted via an obituary in the Worcester (Mass.) Telegram & Gazette. His

wife, the former Joan Rose Kelley, whom he married in 1938, confirmed that he had spent the last eight years in long-term care facilities struggling with Alzheimer's. Their only son, Joseph, is a Massachusetts state trooper. I did not know George very well, but we were members of the MIT Armenian Club, whose only claim to fame was that several members of the club could beat the celebrated Professor Norbert Weiner (at his weakest moment) playing bridge at Walker Memorial. George graduated Course II, cum laude. He was a Corps of Engineers captain serving in the European-African-Middle Eastern theater in WWII. Career-wise, George began with the Riley Stoker Corp., Worcester, Mass., in 1946, moving up the ladder there as chief mechanical engineer in 1967 and, in 1968, he was named VP of engineering. He had also been with Babcock/Wilcox as a design engineer. George was a member of Our Lady of the Rosary Church and its Men's Group, the Riley Stoker Corp.'s Rico Club, and the American Society of Mechanical and of Chemical Engineers. He wrote technical papers on steamgenerating equipment and held several patents in that field. A pianist and gardener, he was an avid tennis player competing in singles and

To those who wish to memorialize a loved one through a donation, you may do so through the MIT Class of 1933 Scholarship Fund (account no. 33818) earmarked "in the name of" rather than "in memory of" the deceased classmate. Please remain in touch.—Berj Tashjian, secretary, 1245 Briarwood Ln., Northbrook, IL 60062-4556; tel: (708) 272-8683

Your class reunion committee met on May 5 just for old times' sake, as we are not planning any reunions until 1999. (We should live so long!) Attending was just

about everyone except Al D'Arcey. Those present were Clare and Paul Wing, Roger Coffey, Walt McKay, Jeri and Larry Stein, Barbara and Tom Burton, Norm Krim, Gudron and George Gahm, Roger Williams, Mary and Russ Hastings, and Mollie and Carl Wilson. Everyone looked great and happy to see one another. As a matter of fact, it was decided that we would repeat this luncheon next year. Russ Hastings took some photos of the group, one of which is below. We learned that John



An off-year meeting of the Class of '34 Reunion Committee included (from left): Jeri Stine, Mary Hastings, Paul Wing, Carl Wilson, Roger Coffey, Walt McKay, Larry Stein, Tom Burton, Norm Krim, and Mollie Wilson. (See '34 column this page.)

doubles competitions in the Boston area.

Elmer Otis Waterman passed away July 11, 1994. Elmer earned a SB in Course I, civil engineering, and it was his whole life. He was in and out of the service in WWII, chiefly with the 93rd C.B. Battalion in the Pacific campaign. He was a civil engineer for the Massachusetts Department of Public Works in his civilian career until retiring at age 70. His one son, Richard B. Waterman, of Reading, Mass., and a sister, Ethel Richter, are his only survivors. In a note just received from Richard, he relates the love of his three children for their grandfather who "was always looking for an interesting science or math item to discuss with them." They will most certainly be among the many who will miss this very dedicated man.

Hawkins has not been well. He had a heart attack and is currently getting around using a walker. John and Madeline have moved from Weymouth. Their new address is: 2701 Pickett Rd., Apt. 3016, Durham, NC 27705-5016. . . . Russ Hastings reports that there is another ISO meeting coming up in China, but he is maneuvering to get out of going. Russ has been working on the committee trying to standardize shipping containers for cargo ships. He and Mary were on the West Coast for a wedding recently and did some sightseeing afterwards. They did not get as far south as San Diego. . . . Sitting next to Paul Wing is never dull. Paul has been working for the last 10 years on a history of stereoscopy. The manuscript is now finished and he is trying to get it published. The problem is that the total

market for this 9x12" book is estimated at about 2,000, with innumerable photos collected over many years and involving a lot of research. The cost of printing is about \$36,000 and negotiations are still under way. Paul and Clare traveled to England recently to attend a meeting of the Stereoscopic Society of Great Britain. The Society is about 100 years old and Paul has been a member for 45 years. At the meeting Paul did a stereoscopic show for the attending members. At this same meeting, he saw pictures of the Hubble Telescope being repaired in space by our astronauts. While some of these pictures were shown on PBS, the members attending saw it on a 80x100" screen and it was fantastic! Paul is looking for a source for four small glass prisms that your secretary will try to find for him. Any classmate knowing a source can contact Paul or your secretary.

Roger Coffey is working several days a week for a friend of his who manufactures hydraulic cylinders of aluminum that are the equivalent of an electronic printed circuit board. Roger does the design and layout for these blocks. Again Roger will get more material to us. . . . Your secretary told a story about a class member whose identity will not be revealed, who wound up several thousand miles from home without his wallet, credit cards, or cash. Fortunately, someone he knew in that city loaned him some cash while he was there. There were many questions as to his identity, his initials, course, where he lived, etc., but still no information was revealed. It seems that the same thing has happened to many of us. Paul Wing told of being loaned 10 cents by a kindly lady so that he could get to his hotel in New Orleans. Roger Williams told of his experience of being stranded on his way to an assignment in Greenland in 1953. A captain in the Army loaned him some money and Roger gave him a check. The check was never cashed. So Roger, knowing the address of the man who had come to his aid, contacted him to find out why the check was never cashed. He then learned that the bank bounced the check as Roger had dated it 1935 instead of 1953! Tom Burton told of Professor Dewey warning everyone in his classes to cash checks and get their money out of banks in 1932. The next day, Roosevelt closed all the banks in the country, many of which never reopened. Larry Stein was loaned money to go home to New Jersey that weekend by Bill Carlisle who was then manager of Walker.

I received a phone call and letter from Ed Geittmann's widow, Mary. She wanted to write to Wing Lem Wu and was delighted to have news of him. She is busy running the business that Ed and she had, making babbit metal. They use lead, arsenic, and ammonium chloride in its manufacture. While she has OSHA and EPA approval, she cannot sell it or give it to her children. Her life is further complicated by the fact that Wisconsin is a Marital Property Law state which means that the family trust Ed set up cannot be touched or borrowed from. While it pays quarterly from its investments, she has no access to the principal. She spends the month of January at Sanibel Island. Mary is a very feisty lady, and is leading a very active life. She misses Ed mightily, but has many happy memories to sustain her.

We reported briefly last month on the death of Al Rogowski. We had few details at the time. We have been in touch with Anita and

aided by John Newbegin, she has provided the following: Al died of a massive CVA (stroke) on May 8, leaving his wife, Anita. They were faithful attendees at both our regular and mini-reunions. About a year ago, a severe stroke left him unable to walk or take part in a meaningful conversation. His degree was in civil engineering. He lived in the dorms and rowed on the crew. It was the sport he most enjoyed and he followed it with interest over the years. Your secretary remembers that Al was one of the oarsmen in the boat we rowed at the 50th Reunion. He worked in the Brooklyn Navy Yard for several years, before joining Worthington Pump and Machinery Corp. He spent 27 years there, starting as a test engineer, then manager of R&D, and finally as works engineer where he was responsible for the maintenance of machine shops, foundries, power plant, private railroad, and construction of new buildings. Alex then moved on to the Eagle Button Co. of New York City. While there, he built a new plant in Carlsbadt, N.I., and also one in St. Thomas in the Virgin Islands. They lived in West Orange, N.J., before moving to the Providence area where they had many ties. John writes that he and Al had been close friends for over 60 years. He still takes pleasure in remembering the good times they had with Bob Emery, the (Larry) Steins, the (Charlie) Luckes, and the (John) Westfalls. Private services were held in Providence at the Unitarian church and Al's ashes were scattered over Narragansett Bay as per his wishes.

A letter from Bill Ball brings the sad news of his wife Lois' death at Cape Cod Hospital on May 19. Lois had open heart surgery in 1988 and never fully recovered her former strength. The class will acknowledge Lois' passing. Bill advises that he will stay on at his home in Dennis and continue his activities there. He suggests a mini-mini reunion somewhere between Cape Cod and Boston and perhaps we can make that happen by the time you read this. . . . John Westfall's widow, Ruth, called to say hello. She was knocked over by a neighbor's dog and broke her hip. After months of recuperation, she returned home one night, fell while walking on her cobblestone driveway and broke the other hip! That plus a cataract operation have made her a little tired of doctors and operations. Otherwise, she is well although she is forced to use a cane because of the two broken hips. She is still living in the lovely colonial home that she and John had in Barrington, R.I.

Hope that you all had a great summer and are looking forward to the pleasures of autumn. Write and call often!-Carl H. Wilson, secretary, 48 Druid Hill Rd., Newton. MA 02161-2023

Editor's Note: We wish to apologize for an error in the August/September column for the Class of '35. In the obituary of Howard Beck that was kindly provided by Irving

Banquer, Irving's name was inserted in such a way as to make unclear who had died. Irving is alive and well, and we apologize for any pain or confusion this may have caused.-Ed.

Thirty of our 1935 classmates and twentyfour wives and guests attended our 60th Reunion. Technology Day on Friday, June 16,

## ClassNotes

also marked the 50th Anniversary of the end of World War II. A highly emotional fly-by at noon of a dozen vintage planes from the war years led by a B-25 and B-26 in memory of the 245 MIT alumni/ae who lost their lives in defense of the United States lent emphasis to the memorial celebration.

At McCormick Hall on June 14, class members and guests arrived to register after noon. The sound level rose as each person came through the swinging doors and clusters of animated friends gathered in the lobby catching up on past activities. Robert Olsen and Walter Stockmayer were busy trying to gather former oarsmen for a row on the river at 9 a.m. on Friday. John Taplin, class president, was busy promoting the class meeting to be held after the reception dinner in the hall living room. By dinner time about 40 of our expected 60 settled around the large round tables with conversations at a high pitch until dinner was served and we could hear the background music. This occasion was the first time we wore our Red Jackets. With dessert being served John Taplin took over to get our meeting started. Philip Johnston was introduced as chairman of the nominating committee and he presented the following slate of officers to serve for the next 5 years until 2000: Thonet C. Dauphine, president; Randolph Antonsen, treasurer and VP; Henry B. Kimball, assistant treasurer; J. Goffe Benson, VP; Leo H. Dee, VP; Hal Bemis, class agent; Philip P. Johnston, VP; John F. Taplin, president emeritus. All were elected by a unanimous vote. Allan Q. Mowatt was elected permanent secretary in the 1975 Class Meeting. Randy Antonsen reported that we had a balance of \$4,900 in our bank account and recommended that we have no more class dues. A loud reaction by classmates confirmed our agreement. Tony gave a short acceptance speech detailing his plans for the future. The meeting was adjourned and turned over the Mrs. Janice Dee to lead our songfest. We broke up tired but happy about 8:30 p.m.

The next morning after breakfast we were bussed to the Museum of Science for our boat cruise up the Charles River. We were served lunch back at the Museum and adjourned to the OMNI theater for the presentation of Titanica. In the afternoon, another dozen joined us for the Cardinal & Gray Reception and pre-Pops dinner at McCormick Hall. Then we were bussed to Symphony Hall for Tech Night at the Pops featuring new conductor Keith Lockhart and the Tanglewood Festival Chorus. It was a glorious concert—they always are. A post-Pops reception made a fitting end to the day.

After breakfast on Technology Day, Robert Olsen, his wife, Norma, Walter Stockmayer, Jim Eng and I walked over to the Pierce Boathouse to meet with the coach of MIT heavyweights crew who gave each of us a gray sweatshirt with an enormous cardinal T on its back and small T with crossed oars on the front. We were joined by a varsity oarsman and cox to launch shell for four and cox. Bob Olsen and Stocky upheld our class by rowing up the river with Stocky at stroke and Bob

right behind him with two MIT oarsmen and cox. The rest of us followed in the coach's launch taking some good pictures and applauding the effort. We joined the program in Kresge to hear the balance of the speakers on their morning program which was extremely interesting. The vintage plane fly-by followed at noon and we all headed to the Athletic Center and the luncheon. We filled more than three large tables. Our Reunion Gift was \$969,000 accumulated in the five years since our 55th with a participation at 89 percent, second only to the 91 percent of Class of 1925. We still hold two highest Reunion Gift participation records of 97 percent for our 50th and 99.2 percent participation since graduation. Our final reunion event was the Cardinal & Gray Dinner and Sing-Along at the Hyatt Regency where we again had full attendance. We parted happy but very tired after our long day. Now we shall begin to prepare for our 65th in June 2000.

The next "notes" will include several items that I am delaying in the interest of time.—
Allan Q. Mowatt, secretary, 715 N. Broadway, Apt. #256 (not a misprint, I'm moving across the hall), Escondido, CA 92025-1880

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**60th Reunion** 

In planning a gathering of classmates living in lower Michigan to see Connie

Bouchard's exotic cars and skeletal clocks, I was overly optimistic about the traveling. Only Henry Johnson, who lives near Birmingham, attended. Bunk Knudson was still in Florida, and Art Sarvis (Course II) in Flint. Wayne Hazen (VIII) in Ann Arbor and Obie Falls (VI-A) in Jackson, who suffered strokes in 1991 and 1993 and uses a walker to get about, both declined. Connie displayed his self-restored cars and made-from-scratch (sheets of brass) clocks, as he has done for vears to gatherings of car buffs-abundant in the Detroit environs. His career was with GM through World War II including design and development of Allison V-12 aircraft engines. Though not the equal of Rolls Merlins, Connie's development produced a very reliable second winner. In fact, in the heat of CBI operations General Chennault needed more P-40s for his Flying Tigers than there were engines. Connie resurrected enough components from rejects to fill the bill (performance tolerances were very tight). Later, Chennault got back to encourage the GM workers: "Keep sending us those scrap engines—they get us over the Burma hump!" Connie moved to Ford in 1946 where he planned, built, and headed its research and engineering center

until retiring in 1973.

The lunchtime conversation about the Institute was enthusiastic, to say the least. Connie pointed to the rewards of his work and hobbies, all founded on his Course II education. Not so direct for Henry, who went from Tech to Harvard Law for a JD, and practiced briefly before World War II service in the Army Signal corps. But the latter included liaison between the Pentagon and Tech's radiation laboratory. Ultimately, as a colonel heading the Corps' purchasing committee, he saw the lab's tremendous accomplishments in adapting British radar to ground, airborne, and naval uses. Add LORAN, IFF, proximity fuses, and a host of unrelated technical procedures and devices, and you have what Henry described as "phenomenal." Lee DuBridge, lab director, later said that radar won the war, the atomic bomb only ended it.

## Saffer's Safer Fertilizer

ducated on the chemistry of explosives in the classroom of Prof. Tenney Davis, Charles Saffer, Jr., '36, went on to serve as a mine-recovery officer and explosives researcher for the Navy, 1941–46. Later, Saffer was the consultant for and the business partner of one Samuel Porter in developing a patentable process for manufacturing non-explosive ammonium nitrate fertilizer.

In the 1960s, Saffer and Porter both saw the potential for a tragic misuse of chemical fertilizer like the bombing of the Oklahoma City federal building. Saffer found that by mixing ammonium nitrate with 5 to 10 percent diammonium phosphate, they could produce a perfectly good fertilizer that would not explode and was only marginally more expensive. But they failed in their efforts either to interest the fertilizer industry in adopting their simple process or to interest state legislatures in mandating "desensitized" fertilizer. Defeated by lobbying efforts of the Fertilizer Institute, a trade organization, they gave up, and their patent expired.

All this came to light recently when the Oklahoma City bombing spurred Saffer to write a letter to the editor of the

New York Times, and his story was picked up and expanded by a num-

ber of journalists.

Now there is hope Saffer and Porter may finally achieve their goal. The lawyer who helped them lobby state legislatures 25 years ago was Billy Tauzin, now a nine-term Democratic Congressman from Louisiana. At Tauzin's request, the House Subcommittee on Commerce, Trade, and Hazardous Materials scheduled hearings in May on so-called fertilizer bombs. At this writing, Tauzin's office was awaiting the results of tests on the Saffer-Porter process by the Bureau of Alcohol, Tobacco, and Firearms, results that it hoped would help persuade the industry to minimize voluntarily the hazard posed by explosive fertilizer.

Connie and wife Helen were gracious hosts, putting me up, treating Henry and his new bride, Mary Ellen Gotshall, and me to dinner at the Women's Club, and providing a bag lunch for my motoring to Ohio next day. . . Knowing from Leonard Mensing's daughter Marilyn that he was just home from the hospital after a hip-breaking fall, I stopped at his Toledo home only to leave a message and a biographical form. Later, on the telephone he told of his work as chief engineer and VP of ETTL and Manno Corporations, which specialized in constructing buildings for banks and other financial institutions. Leonard was Course I, and although he left after sophomore year, after finishing at Lafayette College, he had a very successful career. Living nearby, Marilyn attends to him almost every day, but his recovery is slow.

Items from the canvass: Nicholas Kuehn (Course I), after 34 years service with the city of Chicago, retired as chief sanitary engineer and is enjoying living on the Indiana Dunes of Lake Michigan. He had been chairman of the West Shore Water Producers Association and the Public Health Engineers Club. . . . Auguste Hershev (X-A) worked in petroleum refining until 1970, and then worked for himself in farmland investment and management in Illinois and Missouri. He and wife Mary winter in Sarasota. . . . John Grindell (V) had a military career stateside and abroad. He graduated from the Army Command and General Staff College and earned a PhD in mathematics. . . . Victor Gilbertson (V) practiced architecture in Minnesota after a Steedman fellowship at Washington University, St. Louis, and was a director of the A.I.A. in the 1960s. In World War II he was a captain in the Army Corps of Engineers. His interests have included the Salvation Army and watercolor painting. . . . Earle Kinsman (VI-C), after an SM at Ohio State, worked for Sprague and General Electric, then founded Sterling Engineering and Kinsman Manufacturing in Laconia, N.H. Always very active in civic service, his principal interests since 1986 have been the Ledges Retirement Community's three expansions and the newly completed Congregate Living Center for assisted living and nursing facilities.

The canvass letter to Joseph King (XVI) last September was returned stamped "No forwarding address" from Ormond Beach, Fla. Now a May clipping from the Syracuse Herald-Journal reports his death November 15 "in Florida." He helped design the Bell X-1, the first airplane to break the sound barrier, and worked on the Apollo moon program. Then, as owner of Single Shaft Sulky Company, he invented a new sulky "which revolutionized the sport of harness racing and is now used throughout the world." Jo trained trotters and drove them at New York country fairs and parimutuel race tracks. What a life!

A few days after reaching home from Michigan and Ohio, I learned that Henry Johnson was in the hospital for transfusions, in another setback due to prostate cancer. Facing the ultimate, he came home to Mary Ellen's care, and died June 9. Both were independent in a material sense, and his long-time housekeeper told of their few good months of marriage—they both loved to dance and were looking forward to a year or two more. As for the Institute, his generosity mentioned in earlier notes appears to be only a harbinger of things to come. As a coursemate in VI-A, a reunion oarsman and

good friend, I salute him. Cheers for the lives of Joseph and Henry!—Frank L. Phillips, secretary, 1105 Calle Catalina, Santa Fe, NM 87501; tel: (505) 988-2745; James F. Patterson, assistant secretary, 170 Broadway, Pleasantville, NY 10570; tel: (914) 769-4171

Fred Altman has been traveling quite a bit lately. In April, he drove through France to the "great paradors" in Spain, Cardon, Vic, and Argui Blain. He reports that he has been supporting VITA (Volunteers in Tech Assistance) in their coming LEO (Low Earth Orbiting) satellite effort. In February 1994, he traveled in Puerto Rico. In June, he drove down to Ghent, Bremen, Copenhagen, and Ordi Bergen: took the ferry to Newcastle and Drisham; drove to the Channel, and took the ferry to France. In September, he was with Elderhostel (big bands) at Raquette Lakes, N.Y., and in November he took a Portugal trip, including Madeira. Fred, we find it hard

to keep up with you. At the recent Tech Day, we attended the Boston Pops where the new conductor, Keith Lockhart, presided. He gave a superb performance and has the enthusiastic support of Bostonians who enjoy both his conducting ability and rapport with the audience. The next day, Friday, June 16, we attended the luncheon at the Johnson Athletic Center. The following classmates were in attendance: Joe Heal, Dave McLellan, Ed Hobson, Mel Prohl, Dick Young, Al Shulman and his wife, Rachel, Len Seder, and Bob Thorson. It was there that we learned that our class president, Phil Peters, had a bad skiing accident which caused a detached retina when a ski pole hit his ski goggles.

Joe Heal's wife, Marion, has Parkinson's disease but is holding her own. She acts as his memory and he acts as her legs. . . . Bob Glancy has been very active in the "Golden K" Kiwanis organization serving as program chairman. He and a group of seven helped serve a picnic lunch to over 300 fifth-grade students as part of the DARE (drug abuse resistance education) program. Then he was to take 14 to the Bournlay Workshop (a group of handicapped persons) who prepare meals-onwheels, among other things. Bob recently finished his 15th year of working on tax counselling for the elderly program and concluded another year of teaching a Sunday school class. He also handles a monthly evening video program (from his collection of 250) for residents of La Bar Retirement Village. He is probably facing a second cataract operation this summer and next week he intends to put up flags to celebrate his 80th birthday. Bob, you keep very active and haven't slowed down a bit.

It is with sadness we note that since our last report, we lost four members of our class: Donald Duncan, Austin C. Loomis, Winthrop A. Johns, and Alberts S. Wynott. Donald Duncan was a resident of Manchester, Vt. He was a graduate of Pratt Institute and earned an SB in mechanical engineering at MIT. Donald earned a master's degree at the University of Michigan and New York University and completed his course work for his doctorate at New York University. He taught at the Pratt Institute for about 40 years—taking time off

## ClassNotes

during World War II to work on the Manhattan Project, was a professor of physics, and worked with architects as a heating and air conditioning engineer. He was active in the First Congregational Church of Manchester as trustee and chairman of the board of deacons and the theologian-in-residence program. Survivors are his wife, two sons, and three grand-daughters.

We received just a scant notice that Austin (Rudy) Loomis passed away on February 25, 1995. He graduated from MIT in 1937 with a degree in business and engineering administration. . . . Winthrop A. Johns (Win) died April 22, 1995, of myocardial infarction. Win was our class secretary while we were at MIT. He was president of the Automated Analysis Co. of Toronto, Canada. He had been a Boy Scout commissioner and served as Rotary Club treasurer, VP, and then president. He was also a church deacon and trustee, and his condominium treasurer. He retired to North Palm Beach, Fla., and was a member of the North Palm Beach Country Club. He leaves his wife, Alice, two daughters, and a son.

Albert St. Clair Wynott died on January 27. 1995. Al was 80 years old and lived in Canton, Mass., before moving to Walpole, Mass. four years ago. He graduated from MIT with an SB in building engineering. Al was a cold storage contractor and engineer. He was also an instructor at MIT for many years, served in the Army during World War II, and was awarded the Purple Heart and the Bronze Star. Al was a member of the Masonic order of the Aleppo Temple in Boston and commodore of the Savin Hill Yacht Club and the Aleppo Temple Yacht Club of Boston. He is survived by his wife, Dorothy. All of the bereaved have our deepest sympathies.—Co-secretaries: Robert H. Thorson, 66 Swan Rd., Winchester, MA 01890 and Leonard A. Seder, 1010 Waltham St., B342, Lexington, MA 02173

It looks like we will meet in Newport in '98! At three o'clock on a bright sunny Saturday afternoon on June 17, 11 classmates gathered on the front lawn of Longfellow's

Wayside Inn, Sudbury, Mass., together with 9 wives, as class president Fred Kolb called on 60th Reunion co-chairmen Norman Bedford and Sol Kaufman to report on the committee's results to date. Their report recommended Newport, R.I., an hour and a half from Tech by chartered bus, as the reunion site and gave details of the area and of five hotels. After questions, discussion and comment by the entire group, Newport was agreed on as the site, and the choice of hotels was narrowed to two. Planning to date envisions two nights in Newport and additional nights in Cambridge. Those participating in the discussion included Polly Kaufman, Hillie Bedford, Harry Saunders, Sandy and Lou Bruneau, Flo and Sid Baron, Millie and Ed True, Mary and Harold McCrensky, Phyl and Don Severance, Jean and Ed Hadley, and Madelyn and Paul des Jardins.

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After the group session, cocktails were in order and additional couples arrived including "E" and Frank Gardner, Alice and Roy Hopgood, Janet and Dale Morgan, and Nadine and Vernon Winn. We adjourned to a private dining room for dinner. Ed Hadley's efforts in arranging for the mini-reunion were applauded by all. More than half of the attendees stayed overnight at the Wayside Inn. . . . At dinner Fred Kolb, during a memorial period of silence, slowly read the names of the fourteen members of the Class of 1938 who died during the year. These names already have, or will appear in our Class Notes. Two of our members who responded affirmatively to the January mailing of the mini-reunion notice did not live to make it. Dave Morse died March 29, and Paul O'Connell on June 6. David L. Morse, a retired architect, died of cancer in his home in Newton, Mass. After graduation in Course IV, he started his career with Stone and Webster where he worked on the Manhattan Project before being inducted into the Army Air Corps with which he served during World War II. He was affiliated with the office of David J. Abrahams and later with William Hoskins Brown Associates, with whom he was involved in the design of schools and housing for the elderly, including the Parker Street Apartments in Newton. . . . We will have more about Paul O'Connell in next month's notes.-Paul R. Des Jardins, secretary, 6251 Old Dominion Dr., Apt. 310, McLean, VA 22101-4807; tel: (703) 534-4813; Gretchen Birge, assistant secretary, 233 Carroll St., Apt. 202, Sunnyvale, CA 94086-6264; tel: (408) 736-5011

In June 1939, Course XV graduates with SB degrees started to work for about \$1,500 per year. In May 31, 1995, Wall Street Journal reports MIT's MBAs will start

this year at \$75,000. Having 56 years of hands-on overview, '39ers may be shocked at such huge starting-pay disparity. Whether shocked or shook, some '39ers might comment on the anomaly. If comments come, I'll consolidate them in a future edition.

About 50 MIT Sloan School alumni/ae and 25 guests attended a buffet and a stimulating talk by Philip Condit, '75, president of the Boeing Co. He expects changes in passenger air transport. He said the cost of passenger planes is too high and must be reduced, and that thousands of the oldest planes need to be replaced. Also, the hub system causes delay, increases cost, and decreases safety. Therefore, he expects more uninterrupted flights, probably with fewer passengers in smaller planes. Air fares will be lowered.

Joe Valenta, '69, president of the Northwest Sloan Club, and the Program Committee, offered that pleasant, stimulating meeting in Seattle's Rainier Club. An extra dividend came to me when Michael Goo, '93, and Jeri, his bride of 45 days, drove 40 miles out of their way to take me from Tacoma to the meeting and back. The drive with these newlyweds prompted me to recall that on July 3, 1945, the mayor of Commercy, France, married Hilda and me. The ceremony was in the city hall and spoken in French. Hilda had been a salutatorian in Spokane, but she spoke no French. Therefore she could not interpret the pledges

at the time she was agreeing to them. Ten days after these notes are mailed to Cambridge, she might comment: "Hona, we have been married 50 years, and sometimes it has seemed like only 500."

Marge and George Morrison tilled and planted their 20 acres near Peterborough, N.H. On a three-week trip, they cruised from Lisbon, touched borders of Spain, made ports at Bordeaux and Amsterdam, passed the Kiel Canal, and arrived at Copenhagen where they revisited Tivoli Gardens. They were startled by overseas costs, sharply inflated due to the decline of the dollar. Home now in New Hampshire, George cuts cordwood, mows an acre of grass, and rototills the garden. Marge grows vegetables from seed and cultivates roses. When Eugenia and Fred Cooke visited recently, they all found it pleasant to reminisce about Sigma Alpha Epsilon and exchange travel stories.

Sylvia and Seymour Sheinkopf are circling the U.S. in their silver bullet trailer. Seymour writes: "We'll visit Luna and Leo Kiley in Santa Fe. Then, via the Grand Canyon, we'll stop in Las Vegas where we hope to make a large fortune. We'll see Julie and Charlie Wang near Los Angeles, then '39ers in the Northwest. '39ers near Washington, D.C., held a minireunion in Georgetown. Those attending included Yolanda and Ernie Kaswell, Jean and Sid Silber, Bill Wingard, Helen and Art Zeldin, and Sylvia and me. We all plan to meet again at the Silbers' home in mid-May. Mike Norman sent a video of the ceremonies during which Dom Donatello was honored by election to Alaska's Business Hall of Fame. I'll bring the video to Tacoma. Grace and Mike Norman returned from a trip to the South Seas including French Polynesia. Mel Falkof will attend the 60th reunion of the Boston Latin School Class of '35. That is also my class. Mel still serves as chairman of the Chicago SCORE chapter and we hope to see the Falkofs in Chicago as we come East. Since the First International Sheinkopf Family Reunion was successful (over 130 attendees), I am asked to stage a family mini-reunion for about 60 persons in New York area in October."

After Austie and Hans Bebie returned from China, I referred to an atlas and mentioned population numbers of China's largest cities. Those numbers were obsolete. Hans examined two official references. They didn't agree, either. However, it appears that Shanghai is China's largest city and it's population probably exceeds 12 million. Beijing (Peking) is second largest with more than 9.3 million. Hong Kong, including Kowloon and Hong Kong City, has more than 5.1 million. China covers more of the earth's surface than any other country, and has about one quarter of earth's estimated five billion persons.

Gus Hunicke has a new word processor. He invites classmates to send news and their instructions how to become expert word processors. . . . Barbara and Dick Christie cruised on a "Princess" luxury liner through the Panama Canal to Acapulco. Dick's card pictured a beautiful great white Love Boat, but there wasn't room enough on the card for Dick to say how that affected the passengers.

We are saddened by reports in the Boston Herald of the deaths of two classmates: Roland Boucher of Underhill, Vt., a long-time radio and television meteorologist, died April

21, 1995, at New England Baptist Hospital. He earned a master's degree in meteorology at MIT in 1939. He was known for his nightly television reports on Boston Channel 7. His career included research in early forecasting techniques using doppler radar and Nex-Rad. He served Pan American Airways as a forecaster for overseas operations of its Pacific Clipper Fleet. . . . Irving Finsen of Wayland, formerly of Newton, died April 7, 1995, at the Good Samaritan Hospital in West Palm Beach, Fla. He was 76. Born in Boston, he was a graduate of Boston Latin School and earned a degree in industrial engineering at MIT. He was a principal at Alps Sportswear, a manufacturer of men's and women's sportswear .-Hal Seykota, secretary, 2853 Claremont Dr., Tacoma, WA 98407

The 55th Reunion took place last week and the co-chairs, Bill Stern and Sally (Mrs. Robert) Bittenbender reported that the celebration was a great success. My sincere

thanks to Sally for her write-up of the events. A total of 88 people, of whom 46 were class members, signed up for some or all of the events. At the Woodstock Inn Country Club, classmates and guests met on Tuesday evening for a reception and dinner. Wednesday was free for sightseeing and use of the athletic facilities, followed by a brief class meeting. Class president Norm Klivans reported on the activities of the last five years, and expressed his thanks to class members and to the Reunion Committee for all the help. Treasurer Dick Babish gave a humorous and complete overview of the state of the treasury. A slate of officers was elected, headed by Bruce Duffett as president. Other officers-VPs San Card and Tv Marcy, treasurer Dick Babish, class agent Walt Helmreich, and secretary Dick Gladstone, were all reelected. Norm was thanked for all his faithfulness and hard work during his term as president. Thereafter, biology professor emeritus Irwin Sizer gave a fascinating talk on "genes-who needs them?"

Following the class meeting, D.J. and Charles Edwards hosted a wine party with a supply of fine select stock of Merry Vintners Chardonnay from their winery in Santa Rose, Sanoma Valley, Calif. They also gave some insight into wine-making, its techniques and

On Thursday, it was back to the MIT campus for a pre-Pops dinner at the Hyatt Regency, and then Pops under the baton of new conductor, Keith Lockhart. He honored MIT with special selections and tributes to all who had served their country during World War II. Friday began with a memorial service at the MIT chapel, followed by an excellent series of lectures at Kresge Auditorium. The theme was "War Technology Peace Change" in recognition of the 50th anniversary of the end of World War II. At noon, a group of World War II vintage planes made a slow fly-by, following the river to the harbor and then back, in memory of MIT alums who had given their lives in defense of their country.

Class gifts were announced at the Technology Day Luncheon at the Johnson Athletic Center. Class of 1940 gift was \$604,000. Another series of varied lectures were well received after the luncheon. Some members attended

the Cardinal and Gray dinner and sing-along that evening at the Hyatt, and on Saturday George d'Hemecourt and his wife attended the

Tech Challenge Games.

Sally Bittenbender reported that in response to letters she had sent to all widows of classmates, she had heard from and/or talked to many, including Davette Abkowitz, who attended the Technology Day Luncheon, Marion Wright, Betty Wight, Sue Erb, Maureen Feldman, Margaret Tura, Anne Toon, Angelika Weller, Jane Voight, and Eleanor Libsch .... Norm Klivans specifically asked me to mention how helpful the people in the Alumni/ae Office were in the planning and execution of the Reunion. Special kudos go to Elizabeth Simons and Janet Serman! ... Our new class president, Bruce Duffett, lives at 5900 Overlook Dr., Erie, PA 16505-1132; tel: (814)

There are two notes from classmates who were unable to attend the Reunion. Bob Hess writes from West Chester, Pa., that his "recovery from knee surgery took much longer than normal because of other neurological problems. Other news is that we have just acquired a new grandchild, Joshua. This makes three, two boys and a girl. Our older son, an architect, has just moved from Lake Placid to Milton, Mass." . . . From Marshall McCuen of Indianapolis, Ind.: "Sorry to miss my Class of 1940 55th Reunion. I am on crutches or in a wheelchair all the time due to hip prosthesis and arthritis, and am moving to a retirement home locally. Will keep on volunteering, including Educational Council, interviewing as long as possible."

We also have one obit this month. Robert G. Hall of Huntsville, Ala., passed away on June 10, 1994. As always, I look forward to hearing from you by mail or telephone.-Richard E. Gladstone, secretary, 250 Hammond Pond Pkwy, 1205 S. Chestnut Hill, MA

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### 55th Reunion

Technology Review's deadline envelope arrived in April without news about classmates and

by the time I solicited information via telephone calls to classmates, the May copy deadline had passed. Now as a result of my last month's spade work, some obituaries from MIT received this month, and a few surprise unsolicited offerings, I may have material left

over for next month!

Joe Gavin responded to my call with a copy of a statement he made on April 25, 1995, to the Energy Advisory Board. Joe is an advisor to the Department of Energy. In his statement he made four major points: 1.) We have not had a far-sighted, national energy policy and we need one; 2.) Energy is a dominant factor in our future and for our national security; 3.) DOE has much that not only deserves support but also warrants more aggressive execution; and 4.) We are not now in a cold war; we are in a fiercely contested economic struggle that we can not afford to lose. Joe pointed out the U.S. dependency on oil, "We import 60 percent of our requirements which represents 40 percent of our trade imbalance." Joe lauded the talent at the DOD National Laboratories and the results of their efforts-from the

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Tel: (617) 628-5217 Fax: (617) 628-6333 remarkable success of the fusion research at the Princeton Plasma Physics Laboratory to the major advancements in fabricating superconducting material at Los Alamos National Laboratory. He recommended that the passively fail-safe fission reactor should be built and tested, that greater progress be made in fusion-energy research, and that the TPX (Takamak Physics Experiment at Princeton) be pursued with a sense of urgency.

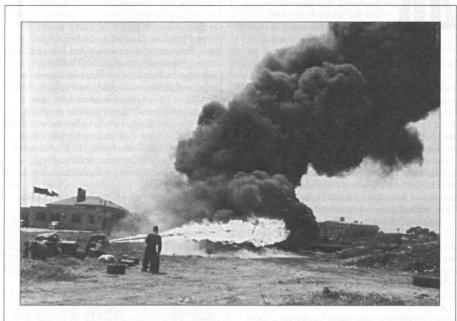
"I caught up with Will Mott, who was on a business trip to Cornell and MIT. He, with Charlotte's help from their home in White Plains, N.Y., supplied the following complicated, but more personal tale. In it one Lou "Sam" Hildebrant of Amsterdam, N.Y., finds his one-time fiancée Susan Mott Leahy in Glens Falls, N.Y., after a 30-year separation. Sam and Susan met at the State University of New York Plattsburgh in 1965. Their engagement was announced in the White Plains Dispatch on March 26, 1966, but the couple drifted apart with one working and one still in school. Last year, both now free of first marriages, met again when the Amsterdam science teacher called up the Glens Falls psychologist. (He had found her location from their parents Christmas card exchanges). They became engaged again in August 1994. Enter a new character, Pam, the Mott's youngest daughter. You may remember Will and Charlotte left our 50th Reunion, direct from Chatham Bars, to attend Pam's ordination to the deconate of the Episcopal Church and to organize and host a celebratory reception for her at their home. Pam, after a lay chaplain's position at Hotchkiss School in Lakeville, Conn., and a position as curate in the Grace Episcopal Church in Millbrook, N.Y., has been called to be pastor of the St. Eustace Church in Lake Placid. She assisted at her sister's wedding on July 1, 1995.

Our new Washington, D.C.,-area alumni directory inspired me to call two classmates from the directory's '41 list. Elmer Greenleaf, of Silver Spring, Md., Course X, attended our 50th, and wrote a biography for the yearbook. He's still at his second career as an "asset management specialist" after many years with the U.S. Department of Energy. . . . Edward G. Sherburn, Jr., Course XVIII, lives in northwest Washington and has been in the science publication business here for many years. As a result of my call Ed sent me a long, interesting letter about his career. Since he didn't attend the 50th or submit a biography, his letter will be a special feature of the November/December Notes.

Father time is again catching up with the class. In April, MIT received a letter from his wife Miriam that Colonel Arthur A. Fletcher, Jr., passed away on July 24, 1994. Art was a member of Course XVI until he enlisted as a USAF flying cadet on September 3, 1939, beginning his flight training in Texas, shortly thereafter. He was serving in the 6th Bomb Group in Hamilton, Calif., when the Japanese attacked Pearl Harbor. Later he flew B17s and B24s as a member of 43rd Bomb group in the Southwest Pacific, where he was promoted to squadron commander of its 65th Squadron. He was awarded the following combat medals; Silver Stars (3), Distinguished Flying Cross, Air Medal, Presidential Unit Citations (3). His other decorations included, the Purple Heart, the American Defense Service Medal, the Asiatic-Pacific Campaign Medal, the National Defense Service Medal, and the

Army of Occupation Service Medal. Following World War II he attended Stanford University where he obtained a BS in aeronautical and industrial engineering. Returning to active duty in 1947, Colonel Fletcher served in a variety of important assignments: group commander of pilot training in Selma, Alabama; director of pilot training in San Antonio, Tex.; Pentagon (one tour), and HQ USAF Europe, Ramstein, Germany (two tours). He also served as the U.S. Commander in Chief, Europe, for the unified command as representative in Africa during the Congolese insurrection and on the staff of the commander in chief, North Atlantic. At the outset of the Vietnam War he was selected to participate in the development of the fighter tactics manual for the Tactical Air Command. He retired in 1964 after 25 years of service. Following his retirement he worked for a defense contractor and then for the U.S. Navy as a logistics mantors, Dayton Area Chamber of Commerce, and the Department of Development of the State of Ohio. He is survived by his wife, Genevieve, of 805 S. Alpha Bellbrook Rd., Bellrook, OH 45305-9709, a son, two daughters, and seven grandchildren.

The theme of Technology Day in June, "War, Technology, Peace, Change," was of particular interest to me since I was associated with MIT's wartime effort at the MIT Chemical Warfare Development Laboratory. Bob Seamans discussed the wartime programs. (See p. MIT1 for a full report.) As a member the Instrumentation Laboratory, he worked on and installed state-of-the-art fire control systems all over the world. His description of the CWS effort included the accompanying picture (supplied by your secretary) of a wartime flame thrower test with the MIT dome in the background. One of the "ants" in the foreground is yours truly.



Class Secretary Charles King, '41, testing a WWII flame thrower. (See '41 Notes, above)

agement specialist in maintenance support and management effectiveness. In 1968 to 1969 he was a fellow at MIT for international marketing. In addition to his wife, Miriam, of 5 Esperanza Circle, Lexington Park, Md., he is survived by a son, a daughter, three brothers, and three grandchildren.

MIT also forwarded the sad news that Jack M. Klyce, Course V, died on December 26, 1994. A member of Phi Kappa Sigma, Jack was an interested participant in many activities before graduating from MIT with our class: All Tech Smoker, Field Day Usher, Marshal of the Tug of War Team, Institute Committee, Open House Executive Committee, Senior Week Committee, Walker Memorial Committee, Alpha Chi Sigma, Beaver Club, Osiris, and the Chemical Society. After several years in automobile retailing in Memphis, Tenn., and Dayton, Ohio, he turned to real estate in the Dayton, Ohio, area. He was exclusively engaged in industrial, commercial, and investment real estate. He was a member of the St. George Episcopal Church, a former member of the Dayton Area Board of Real-

Early on Technology Day, a memorial service for deceased MIT Alumni and Alumnae was conducted at the MIT Chapel by the MIT Jewish Chaplain, Miriam Rosenblum. Names of Class of 1941 members, reported as deceased from March 26, 1994, to April 1, 1995, and appearing in the Memorial Service Program, follow: Johan M. Anderson, Richard C. Collins, Jr., Malcom J. Dodd, Richard M. Gill, Carl L. Goodwin, Gardner M. Ketchum, Harold A. Lent, John M. Lindstrom, Robert S. Lundburg, Dwight F. Mowrey, John C. Slater, and Hugh K. Spaulding. The class expresses its deep sympathy to the loved ones of these departed classmates as well as those newly reported this month.

Two other, very much alive, classmates attended the Technology Day Luncheon Sepp Dietzgen confirms he is working on arrangements for the 55th Reunion at Martha's Vineyard with Vineyard resident Sterling Ivison. The other attendee, Ed Marden, volunteered to help, too.—Charles. H. King, Jr., secretary, 7509 Sebago Rd., Bethesda, MD, 20817-4839; email: <olspaceman@aol.com>

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More from Lou Rosenblum about Jack Sheetz's extraordinary work on our 50th Reunion Yearbook. Jack had separate files for each of the 253 classmates who sent in biographies.

The files contained the original hard copy of the reply, computer discs, and subsequent correspondence. He also edited every one of the biographies. The class is, as ever, in his debt.

The summertime dearth of class news has certainly set in, but we always have obits: Sutton Monro died at South Burlington, Vt. He had been, for many years, a professor at Lehigh University. . . . Also, Irv Fagerson, a PhD in food technology who was a professor at the University of Masachusetts. Our condolences to their families.—Ken Rosett, secretary, 281 Martling Ave., Tarrytown, NY 10591

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Chris Matthew has reported the death of Edwin H. Stewart, Jr., (Course VI) in California on May 27. After graduating from MIT, Edwin earned an MBA from Harvard in

1947. He had a 41-year career as an electrical engineer and was an active member of IEEE. He is survived by his wife, Carolyn, of Los Altos Hills, two sons, and several other family members. We extend to them our condolences.

Chris and Marjorie spent Easter visiting daughter Joyce in Provence, France; then went on to enjoy Orthodox Easter in Greece with other family connections. In June, Chris was in Cambridge, performing his allotted duties as a Corporation alumni/ae term member.

The Alumni/ae Association has sent notice that Leonard S. Croan (Course III) passed away on May 23, 1994, in Alexandria, Va. He was retired and is survived by his wife. Further information is lacking. We mourn his loss.

In the absence of other news, I am glad to render in full the clearly written and well-composed note from Alex G. Smith (Course VIII), Gainesville, Fla. "On May 6 I completed my 47th year of teaching physics and astronomy at the University of Florida. I still get a kick out of teaching and research, so I have no immediate thoughts of retiring. During the academic year I was stunned and pleased to receive a coveted teaching award selected by a committee of faculty and students. The significant increase in salary is of course welcome, but much more important was the recognition that after 47 years my teaching was still fresh enough to win approbation!" A Bravo and Well Done to Alex.

Once again your secretary performed in the annual production by the Gilbert & Sullivan Society of Tulsa. This year it was *The Sorcerer*. I am not yet disqualified by either advanced age or diminished talent.—Bob Rorschach, secretary, 4727 S. Lewis Pl., Tulsa, OK 74104-5138

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We have received word of the death of Edward P. Wyruchowski, Course I, on December 9, 1994. He retired from the Army and had made his home, for many years, at Bain-

bridge Island, Wash. Our condolences go to his son, Edward. We do not have other information.

Edward P. Radford gives enthusiastic endorsements for reunions. He writes from England: "Although technically 'retired,' I am being kept busy with medico-legal consulting, and go to the United States frequently. Jennifer and I both enjoyed very much our 50th Reunion last year, and look forward to the 55th in 1999. Children all live in the U.S. and I now have nine grandchildren." Congratulations, Edward, you have certainly gone forth and multiplied. If we do have a mini-reunion, we shall ensure that you get a notice.

More on the ongoing saga of our fraternities. Peter Quattrochi writes the following: "Several years ago, Phi Kappa merged with a smaller group, Kappa Theta, and the successor fraternity became Phi Kappa Theta, which is still at 229 Commonwealth Ave. I have fond memories of that location because I moved the house from 312 Beacon St. to Commonwealth Ave. in 1943. Our landlady, Mrs. Flanagan, would not renew our lease on Beacon St. because we were 'too rowdy.' As chapter president, I had to scramble mightily to find new quarters, as well as a person who would buy and rent us the property. Today, the fraternity owns the house, and all is well." Now we know how Pete got his training for the marvelous legwork that he and wife Jane did for our 1991 mini-reunion at Charleston. But poor Mrs. Flanagan, what would she have said about Animal House?

We are also thankful to alert alumna Alice Man, '93, a former member of Epsilon Theta for additional clarifications. She writes: "First of all, Zeta Beta Tau is not coed. The two MIT coed fraternities are Eta Theta and Delta Psi (No. 6 Club); as you stated, Eta Theta is a local fraternity since it broke from Sigma Nu. Delta Psi is a national coed fraternity. Sigma Alpha Mu became Fenway House, a coed living group. Pi Kappa Alpha became pika, another coed living group."

In reference to the term "coed fraternity," Alice continues: "Probably this is a case of gender ambiguity in the English language—while words like 'man' or 'fraternity' can refer to only males, they can also refer to all humans. Since words such as 'woman' or 'sorority' refer only to females, most statements that apply to everyone must use the generic, sometimes male terms. Believe me, a lot of feminists aren't crazy about it either!" Well said, Alice, your comments are refreshing.

This is a call for stories. Our class is extraordinary in the annals of MIT. On us, the gods had invoked that ancient decree: "May you live in interesting times!" Our individual experiences form the mosaic of our class history. Yet, few of us have committed to paper what happened during those turbulent years. The class now has the time and the advantage of perspective to appreciate, perhaps to benefit from, what you care to share. Send your reminiscences to either of us.—Co-secretaries: Louis R. Demarkles, 77 Circuit Ave., Hyannis, MA 02601; Frank K. Chin, 221 St. Paul St., Brookline, MA 02146

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Our 50th Reunion has come and gone; now we must wait another 50 years for another such party! The Cambridge weather for both Commencement and Technology Day

was great, as were the events. At Commence-

## ClassNotes

ment, 52 of us marched in our new red jackets-and for old times' sake we had lunch at the old V-12 study hall in the Grad House. No, we did not have Navy issue aluminum trays. . . . Pops, Technology Day, and our Dinner Dance with Navy V-12ers proved to be outstanding. You probably have read about the formal affairs elsewhere but only here can one rave about the weather and the 214 individuals who attended our V-12 affair. A great show all the way around. . . . Black Point Inn on Cape Elizabeth, Maine, was a wonderful location for us to relax and enjoy one another's company. Despite the rain up and down the East Coast, we escaped with limited sprinkles as golf and tennis were played without interruption. We even had luncheon at the pool twice, as well as an outdoor lobster bake.

Classmates came and went and returned during this 8-10 day period and at this point (5 days later) we still do not have a complete head count, but it appears that between 90 and 100 of us were on hand at one time or another. An outstanding record when you consider that our truly active count is less than 220. Jim Levitan and his Reunion Gift Committee are to be congratulated on raising over \$4,000,000 as our 50th Reunion Gift—an average gift of between \$15,000 and \$20,000 per alumnus/a. Class officers for 1995-2000 are as follows: president: Bob Maglathlan; VPs: Frank Gallagher, Charlie Patterson, Jim Levitan, Jake Freiberger, and George McKewen; class agent: Ray Grammer; treasurer: Jim Pickel; and yours truly as secretary.

Tom McNamara's wife, Louise, died of cancer on February 10. Through the years Louise has often been the life blood of many greater-Boston activities. It was Louise who got the old men off their duffs in her happy smiling way. We shall miss her. . . . Eleanor and Joe Neschieda celebrated their 50th wedding anniversary earlier this year, having been married on January 20, 1945, at the Enid Air Force Base, Oklahoma.—Clinton H. Springer, secretary, P.O. Box 288, New Castle, NH 03854

50th Reunion
The first seven class members

noted below attended last June's Technology Day. In later editions, there will be reports on others who attended. Dan Cooper is president of Cooper Communications & Productions at 18 South Orange Ave., South Orange, NJ 07079. Dan had already, in June, received 65 questionnaire responses for our 50th Reunion. He says these 65 class members are about evenly divided among full-time employed, part-time employed, and fully retired. We hope Dan will receive a lot more replies. . . . Ken Davis works and lives in New York City and is managing director of Bentley Associates. Ken negotiates and arranges financing for corporate mergers, acquisitions, and leveraged buyouts. . . . Glen Dorflinger, our class president, came up from Houston, Tex. Glen is managing partner for Partners International Develop-

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ment. . . . Jim Goldstein is the founding and managing partner of his New Jersey architectural firm, James Goldstein & Partners. . . . Win Hayward is a retired electrical engineer and a retired naval officer. He lives in San Francisco. . . . Herb Hansell is practicing law in Washington, D.C. He uses his high-level experience from prior work in the U.S. State Department. . . . Mario Vinci lives in Laguna Beach, Calif. He is a stock broker and gives investment planning advice.

For our 50th Reunion Yearbook, we need more pictures from our 5th and 10th Reunions in 1951 and 1956. If you have pictures, please send them to John Maynard at: 178 Meadow Way, Palm Beach Gardens, FL 33418. As of June, John had received about 100 biographical responses from class members. Please mail your response soon, if you have not already done it.

John L. Bateman, MD, writes from Huntington, N.Y. He appreciates recent public interest in, and would like to see more published statistical information concerning, the efficacy of Affirmative Action programs in education, employment, and housing.

Edward J. Bacon writes that he is living in Rehoboth Beach, Del., in the summers and winters in Las Cruces, N.M. Recent trips included Turkey and Gila Wilderness in western New Mexico. Later this year he will go to Europe and Alaska. He does volunteer work and has four and a half grandchildren.

We are saddened to learn of the death of Peter Sluis, who died on January 2, 1994. Peter majored in chemical engineering and was employed by Radio Station WFME in West Orange, N.J. He is survived by his widow, Anne.—Ned Tebbetts, secretary, 8 Jerusalem Road Dr., Cohasset, MA 02025-1100; tel: (617)383-1662

Jerry Cox is still teaching and doing research at Washington University in St. Louis—in broad-band networks, multimedia and biomed applications. He says it's still lots of

fun so he doesn't plan to quit just yet! . . . Robert Drye moved to Tempe, Ariz., two years ago after psychiatric practice in Seaside, Calif., and Oil City, Pa. Now he's on the University of Arizona College of Medicine faculty part-time-and also consults on primary-caresupporting single payer health care. . . . Bob Kincheloe writes from Bainbridge Island, Wash. He retired there after 40 years on the EE faculty at Stanford. In 1993 he was the faculty sponsor for the cross Australia World Solar Challenge Race from Darwin to Adelaide.

We have three deaths to report this month. Godfrey Coate died in January in Belmont, Mass. He was semi-retired from Charles S. Draper Labs and is survived by his wife, Clelie. ... Jim Hennessey died in February in Louisville, Ky. He had worked for the General Electric Co. . . . Finally we just received word that Grant Umberger died in June 1994 in Gainesville, Ga. He is survived by his wife, Sally.

Ann and I were pleased to attend a program at MIT in May honoring the MIT Sustaining Fellows. (Sustaining Fellows are individuals who have made significant gifts to MIT over the years.) During this program a plaque bearing the names of all the Sustaining Fellows

was dedicated and is now located outside of room 10-250. Harl Aldrich and his wife, Claude Brenner, Harold Brown and his wife, Robert Hagopian, John Karmazin and his wife, Willis Reals and his wife, Jack Rizika and his wife, and Donald Van Greenby and his wife also attended the tribute. We must also mention the other members of the Class of 1947 who are Sustaining Fellows but were not at the tribute: V.K. Atkins, Jordan Baruch, John Bradley, Paul Cook, Quentin Groves, Phil Jonsson, James Lago, Henry Lee, Bill McCurdy, Bob Melville, Philippe Meyer, Bob Mitchell, Bernard Palitz, Ed Rosenberg, Robert Solnick (deceased), Mary Frances Wagley, and Howard Zwemer.-R.E. "Bob" McBride, secretary, 1511 E. Northcrest Dr., Highlands Ranch, CO 80126

Denny McNear married Barbara Stanton Gaillard of Gibson Island, Md., in May. I wish Barbara and Denny many happy years of shared experiences.... George Clif-

ford completed another successful year as chair of the Millis Community Chorale. They gave several performances during the year and had a family day picnic to celebrate a good year.... Ben Ball joined Corporate Economic Research of Americas, Inc., in consulting areas related to a business moving into industry leadership. Ben is currently director of MIT's Integrated Energy Systems Project. He has written over 75 articles for professional journals and books.

Associate Professor Jacqueline N. Hewitt, previous holder of the Class of 1948 Career Development Professorship, was chosen last May by her faculty colleagues to receive the 1995-96 Harold E. Edgerton Award for "significant contributions to the study of gravitational lenes-the bending of light by matter predicted by general relativity." She discovered the first Einstein ring and also discovered one of a handful of gravitational lenes known as "quads," which consist of four split images of a distant radio source. Currently she is developing an array of very small radio telescopes, each with wide fields of view that montior transient radio sources.

Jackie has four graduate students and three undergraduate research students working in her group. In all, she is successfully mentoring a large, highly talented group of young scientists. Her group is arguably the best in the world at discovering, investigating, and probing the physical properties of radio sources in the universe.

As a guest of the class at a champagne brunch at Endicott House in December 1992, Jackie noted an important benefit of the professorship: it included funds for graduate students, which spared her many hours of effort seeking funding from other sources.

Our contributions to MIT at the time of our 40th Reunion are used to fund the Class of 1948 Career Development Professorship. Professor Anne M. Mayes, current holder of this professorship, was appointed assistant professor of polymer physics in MIT's Department of Materials Science and Engineering in 1993. She is the author of numerous publications and has received several awards for her research, including the National Science Foundation Young Investigator Award in 1993.

Sheldon Kaplan died while playing tennis at the Mid-Town Tennis Club in Chicago. He had run a number of diverse companies including Trilite, which makes vehicle emergency lights and United States Railway Equipment Co. He and his wife, Patricia, had been living in Chicago since 1950. On behalf of our classmates, I extend our sympathy to Sheldon's wife and her family. Sheldon's name does not appear in *Technique*, and MIT has not had an address for him, but he did receive degrees from Course II and XVI.—Marty Billett, secretary, 16 Greenwood Ave., Barrington, RI 02806; tel: (401) 245-8963

A four-page, single-space letter from Jack Fogarty provides a brief summary of his many activities in retirement. The letter makes fascinating reading but no way will it fit

in this column. Herewith are some highlights: Jack is into mentoring kids in astronomy, helping the Friends Committee on National Legislation, and explaining American slang to high-level immigrants who struggle with our language (try explaining "cooked his goose" or "by hook or by crook"). He has invented and installed equipment which permits a quadriplegic to change channels on his TV (the man can only push buttons with his chin). Jack is involved in astronomy with the International Occultation Timing Association and helping the inmates in several nearby prisons.

Eight students have been chosen as this year's recipients of Class of '49 Scholarships. Iliana L. Fujimori worked last summer for Toshiba in Kawasaki, Japan, as an intern with MIT's Japan program. . . . Andrew R. Beecham is majoring in computer science and engineering. . . . Jodi Krawczyck worked for Hewlett Packard last summer and is a member of the women's crew team. . . . Maisha N. Richard interned at the offices of Shell Offshore, Inc., in New Orleans. She is a volunteer tutor for sixth through eighth grade Cambridge-area students. . . . Rosanne Rouf is majoring in EECS. She is cultural chair for the South Asian Student Association and is active with the Bangladeshi Student Club. Like Maisha, she volunteers weekly in Cambridgearea schools. . . . Jonathan T. Walter was an engineering intern last summer with a firm in Coopersburg, Pa. He has rowed with MIT's lightweight varsity crew for two years. . . . Owen B. Wessling is working on an Undergraduate Research Opportunity (UROP) project involving robotic fish. He is active with the Society for Creative Anachronism. . . . Aleksy Zinger, born in Moscow, but now a recent emigré, enjoys theoretical math and is working in the Magnet Lab on thin film superconductivity.

George Haviland, a distinguished aeronautical engineer, died of cancer in Prescott, Ariz., on December 8, 1994. I am indebted to Sid Howell for writing to me with details about George's career adding to information from the Alumni/ae Office. Between the two sources, the following emerges:

Having been a fighter pilot during World War II, George was persuaded to rejoin the Air Force during the Korean War and was assigned to Wright Patterson AFB at Dayton, Ohio, as a research and development engineer. He was then posted to Korea. In 1973, George retired as a colonel in the Air Force and became chief of structures at Rockwell. Subsequently, he became chief of structures on the B-1 bomber. George received a master's in aeronautical engineering in 1950 from MIT, an MBA from the University of Chicago in 1958, and a PhD from UCLA in 1968. He is survived by his widow, Dr. Marsue McFaddin Johnson Haviland, three sons, and a daughter.

A note from Mrs. Marjorie W. Lyon tells us that her husband, Harvey Lyon died on March 27, 1995. The *Alumnilae Register* lists Harvey's business affiliation as a consultant and designer in Arlington, Va. I regret the lack of further information.

On behalf of the class, I extend our most sincere condolences to the families of these two men.—Fletcher Eaton, secretary, 42 Perry Dr., Needham, MA 02192; tel: (617) 449-1614

I write this in late June and our 45th Reunion has come and gone. About 10 percent of our classmates took part and they seemed to enjoy themselves in Newport or Cam-

bridge or both. I would like to suggest to the other 90 percent of us that we seriously consider attending the next reunion. It will be our 50th, we get to wear the cardinal red blazer, and it will be the first year of the new century (Please don't send me letters telling me it will be the last year of the current century. It will be the first year in our lifetimes that starts with a "2.")

In last month's column I included a letter to class president Bob Mann from class secretary Jack McKenna resigning from his position. Jack included a nice comment about my efforts filling in for him. At the class meeting that is part of every reunion, all the other class officers were reelected. The attendees saw fit to accept Jack's suggestion and elected your humble servant as class secretary. So thank you, Jack, for your compliment and your nomination. Thank you also for your 40-plus years as class secretary and over 300 columns. I shall try to live up to the standard you set, and to my classmates, I shall endeavor to report interesting items without boring or offending you.

Jack's recovery from his stroke has been remarkable. He and Dot attended all of our reunion activities in Newport and Jack was as sociable and charming as ever. He plays golf and fishes from his boat when he gets a chance. He does have trouble reading. Give him a call if you are on or near the Cape.

Sam Raymond, who played a mayor role in the success of reunion, also got a big credit at the end of the IMAX film, *Titanica*. If you are near an IMAX or Omnimax theater, be sure to see it. Sam's firm, Benthos, supplied key items for the submarine that found and studied the sunken Titanic. *Titanica* played here in Boston at the Museum of Science, but unfortunately the run will be over by the time these scribblings reach you.

You may have already heard from reunion co-chair and class agent Mal Green about this, but Mal wanted to do something with the 200 or so biographies that classmates submitted to be on display at Reunion and also with the analysis I did of the Confidential Question-

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44 Brattle Street Cambridge, MA 02138 (617) 864-7900 naires that 170 or so of you were foolish enough or bold enough to send me. If he has not yet sent you details of how you might get a copy by the time you read this, I shall visit the issue again in a future column.

Eric Anschutz writes from Bethesda, Md., that he retired in 1989 from the Federal Senior Executive Service. Since then he has been a management consultant and an adjunct faculty member at the George Washington University Center for Organizational Effectiveness. He has written TQM America, just published, and The American Advantage, due out in 1996. Eric plays tennis four times a week. He and his wife enjoy tending the balcony garden of their mid-town condo, and they visit their children and grandchildren in San Francisco and Boston frequently. . . . I received a news release from the Nash Finch Co. of Minneapolis, Minn., announcing that they had separated the positions of CEO and board chair and that

they had elected longtime board member **Don Miller** as board chair. Don's management consulting business is based in Forest Hills, N.Y.

... Harold Moss wrote from Boynton Beach, Fla., where he now lives, that he could not make it to reunion. The complex story began in July 1994 when he signed a contract for a house in Boynton Beach. Expecting a February occupancy (can anyone guess where this is going?), he and his wife sold their house in Old Bethpage, N.Y., and moved out in the middle of August. Then came Hurricane Gordon, building code changes from Hurricane Andrew, and "the usual" builder's delays. Harold and his wife have been "visiting" in-laws, children, siblings, and friends since August. As of late May, the closing was scheduled for reunion week. I hope it happened on schedule, Harold. See you at the 50th.

Harry Raab writes from Virginia that he will be retiring August 1 after 43 years working in physics for the Navy Nuclear Propulsion Program. For the last 23 years Harry has been chief physicist. . . . Jay Bedrick wrote in May that he retired from United Technologies Corp. in 1991. He worked full time as a consultant until December 1993. Jay and Betsy divide their time between Florida. Boston, and Vermont. Jay is a volunteer ski ambassador at Mt. Snow in Vermont. Betsy has retired from teaching. Their son and two daughters are married and have produced four grandchildren. A fifth was due in late May.

There is some sad news to report. David Blair sent me a letter about the death of his father, Raymond Blair. Ray died on May 25 in Easton (Pa.) Hospital a week after celebrating his 80th birthday with his wife and family. David remembers his father sharing with him Harold Edgerton's "Strobe Probe" in the pages of *Technology Review*. Ray was a fingerprint analyst for the FBI in the 1930s and served in Europe during WWII. After MIT, he worked as a writer and editor in the field of

printing and graphic arts, retiring as editor-inchief of the Graphic Arts Technical Foundation. Ray wrote Elements of Industrial Systems Engineering and edited The Lithographers Manual. . . . Ronald J. Rabalais died in May of 1993. Ron lived in Williamsburg, Va., and is survived by his wife, Ruth.—Robert A. Snedeker, secretary, Seven Mashie Way, North Reading, MA 01864; tel: (508) 664-1738

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### **45th Reunion**

Our class can best be characterized by its interest, energy, innovation, and generosity. In

preparing these notes each month, this pattern is easily discernible by observing how each of you has developed your lifestyles and your careers. Story after story confirming this can be readily extracted from the files that I have kept over the years. When called upon to act collectively, these same qualities shine through. The clearest example of this started over five years ago. We were about to mount a fund-raising effort to benefit the Institute in honor of our 40th Reunion. We were not satisfied to follow the normal mundane practice of most fortieth reunion classes of simply raising monies for the general fund. We set about to uncover the more pressing areas where this funding should best be applied. A year went into the study that led to our establishment of the Class of 1951 Fund for Excellence in Education. The Fund was to focus on the seeding of projects that would advance the quality of the undergraduate educational experience.

The group I worked with in doing this realized we were entering uncharted waters. How would the administration, the faculty, and



n the opening article in the July issue of MITnews, we mention that Jerome Lemelson holds patents covering key components of supermarket bar-code scanners. But the distinction of producing the *first* operational bar-code system designed for supermarkets goes to John Esserian, '50, and his collaborators at Charecogn, Inc.

Esserian founded Charecogn in 1960 to develop computerized checkout systems that used hand-held bar-code scanners as the primary data input. In 1965, the company won a contract with the U.S. Department of Agriculture to deliver a prototype system for supermarkets. The system was delivered in June 1970, and two months later it was unveiled at a national press conference in Hyattsville, Md., presided over by Virginia Knauer, President Nixon's cabinet advisor on consumer affairs (above left). It was an occa-

sion Esserian (at right) considers "the Kit-ty Hawk of supermarket barcode scanning." The fellow in the middle is George Irving of the U.S. Department of Agriculture.

Alas, being first does not always ensure the greatest success: the successful demo "helped unlease a torrent of research and development by large companies with deep pockets," according to a 1994 article in ID Systems magazine. The distinctive "sunburst code" designed by Charecogn lost out in the standarization battle to the now-ubiquitous UPC (Universal Product Code), and Esserian's company failed to capture the retail grocery market. Reorganized, renamed Second Dimension Data, Inc., and relocated in North Scituate, Mass., Esserian's company continues to work on developing new technology using the sunburst code.

most of all, our class react to this innovative approach? The MIT administration would prefer our designating these funds as unrestricted. Would the faculty heads feel we were meddling in their domain? We needed their cooperation to stimulate their staffs. Would they have to promote the time and consideration to obtain the proposal efforts needed to make this work? Most of all, would our class-relying largely on our members instincts, faith, and some sketchy hopes-provide the funding that would be the foundation for this program through pledges and contributions? The response to these unknowns came first and foremost from you. You resoundingly endorsed this innovative direction by enthusiastically pledging \$750,000. The size and generosity of your endorsement determined the response from MIT and its faculty. Solicitations to take advantage of this opportunity went out from the Administration. Numerous quality proposals were developed.

Last year the initial set of four projects were funded and begun. The fruits of your faith and generosity are now becoming evident. Reports on the accomplishments of these initial projects have been received. I believe you will find the results of these projects gratifying and exciting. I intend to provide descriptions of these results over the coming months. You will find your faith and support amply rewarded. In May, a meeting was held to consider funding a second round of projects. Five projects were approved along with the request to allow the deferred project to function during this coming year. Two of the projects delve into using computer graphics and animation to understand some of the more abstract engineering concepts. Two other projects introduce ecological and environmental considerations to the solution of engineering problems. An add-on to a project from last year, promotes the employment of collaborative methods on the problem-solving process. The length of my notes this month is already taxing the space Technology Review allows. I want to do justice to the descriptions of approved projects by providing this to you in future Class Notes.

Your faith in moving into this uncharted ground has received a major endorsement from an unexpected new source. The MIT Class of 1955 held their 40th Reunion this year. In setting the major direction for their fund raising, they became aware of our class's pioneering effort. They chose to establish a fund modeled after our efforts to support similar projects. Their step is most welcome. The one frustrating part of this activity comes when you have to reject funding for many other worthwhile proposals. This year, there were proposals requesting \$209,000. Only \$60,000 was available for allocation. The additional resources coming from the Class of 1955 will bring life to additional projects that deserve support. In their solicitation brochure, the Class of 1955 graciously acknowledged the contribution of our class in helping them set their directions. I would like to express, on behalf of our class, an appreciation of what they are embarking to do. Their commendable efforts have both complemented and complimented those of our class.

Following a long and notable career at Grumman Aircraft Engineering Corp., Robert Kress has retired. This gave him the time to send us a reasonably detailed rundown of his distinguished career that encompassed most of the major developments in this dynamic industry over the past forty years. Following graduation from MIT in aeronautical engineering, he obtained an MS in applied mathematics at Adelphi University. He joined Grumman in 1951. During the early fifties, he was engaged in the analysis of aircraft and missile stability. He helped design several fixed base simulators used in the study of the flying qualities of aircraft such as the F (F-6, XF10E-1, F11F-1), and a proposed STOL ASW flying boat. He was project aerodynamicist for the Army Mohawk Observation Aircraft. During the late fifties, his work turned to the design of STOL and VTOL aircraft. When Grumman was awarded the Lunar Module contract, he became manager of LM guidance navigation and control and later the LM systems project engineer. Assignments such as engineering manager of the F-14A program and deputy director of product engineering development followed. From 1976 until retirement in 1987, he was the director of advanced concepts in the business development department. This work included efforts on VTOL aircraft concepts. During his two-year retirement, he worked as a consultant to Grumman, DARPA, and NASA. He rejoined Grumman in 1989 as VP for advanced programs, aircraft systems division. In June 1989, he took his second retirement but continued as a consultant to Grumman. He started a model airplane manufacturing company called Kross Jets, Inc. His wife, Frances, is currently that company's president. In 1987, he also formed the Hudson Valley V/STOL Aircraft, Inc., to promote and design flight-test demonstrators of vertical take-off and landing feeder type aircraft. This is currently his main activity.

In April of this year, George R. St. Pierre was appointed chief scientist for the materials directorate at Wright Patterson Air Force



George St. Pierre

Base. He will be serving as an Intergovernmental Personal Act fellow while holding a permanent position at Ohio State University. Having received his ScD from MIT in 1954 and working as a senior metallurgist at the Inland Steel Company, he joined Ohio State University in 1957 and was an officer at the

USAF Materials Laboratory at Wright Patterson. He is a Fellow of ASM International and TMS/AIME and has been a visiting professor in China and Australia. His numerous awards include the ASM Gold Medal in 1987, the Bradley Stoughton Award in 1961, the AIME Educator Award in 1987, the John F. Elliot Lectureship in 1995, the Alumni Distinguished Teaching Award in 1978, and the Distinguished Scholar Award in 1988. He was chosen to be the Invited Fellow of the Japan Society for the Promotion of Science and is the editor of ISS Transactions. His teaching and research has focused on the application of materials science, thermodynamics, and kinetics to problems of advanced materials processing and their use at high temperatures. He

## ClassNotes

serves on several boards including the advisory board for chemical technologies at Argonne National Laboratory, the board of directors of TMS/Aime, and the visiting committee for MIT's Materials Science and Engineering Department.

We congratulate and wish John J. Sewell our best on his retirement from the University of Massachusetts/Lowell. . . . Adding to his already impressive collection of honors, Howard E. Simmons has been awarded the Lavoisier Medal for Technical Achievement. This award, created by DuPont, honors scientist and engineers whose contributions have resulted in measurable and significant technical and business achievement. During his 38 years at DuPont, he has contributed as a chemist and as VP for R&D. His work on structures and mechanisms led to a new class of structures for synthetic enzymes and catalysts. As a research leader, he expanded DuPont's fundamental research into the life sciences, imaging, and electronics. In 1992, President Bush presented him with the National Medal of Science.-Martin N. Greenfield, secretary, 25 Darrell Dr., Randolph, MA 02368

Technology, among other things, changes our lives over time in big ways and small ways. This startling insight was brought to mind by the 25th anniversary of an inven-

tion that has changed most of our lives a little bit: the automatic teller machine. That anniversary was actually over a year ago, but Class Notes gets stale news the way pigeons get stale bread-we take the crumbs that are thrown to us. The ATM is worth mentioning because of the leading role that John Rydz played in its development when he was a VP at Diebold, Inc., a manufacturer of bank vaults then, and now also the leading manufacturer of ATMs in partnership with IBM. John has had an impressive career. He was manager of new business development at RCA; an executive VP at NUCOR; a VP at Diebold, as noted; a VP at Singer, where he led the development of an electronic sewing machine; and until he retired, a corporate VP at Emhart, where he established and led an innovation program that resulted in over \$200 million in annual sales. Just think what this man could have done if he had been able to hold a job. Now he teaches management parttime, and runs a music publishing business with the intriguing name of "Music Memories" out of his home in Connecticut. I personally look forward to learning more about this latter enterprise.

E-mail is another technology that is going to change our lives a little. I was pleased to learn that our class president, **Bob Lurie**, and reunion chairman, **Stan Sydney**, each have e-mail addresses (<rml@bitwise.net> and <ssydney@world.std.com> respectively) when Bob sent me the text of a letter to selected classmates touting our 45th Reunion, October 25–27, 1996, at the Hotel Hershey, Hershey,

Pa. This site was chosen for its convenience for alumni/ae living in the northeastern U.S., as well as for its pleasant amenities and beauty. The reunion is only a year away, now. Make plans for it! Bob also included a copy of the letter of condolence he sent to Roberta Crocker, the widow of Dave Crocker, noting among other things Dave's "almost single-handed efforts in producing our 40th Reunion yearbook," as well as mentioning Roberta's own considerable contribution.

Last time I mentioned that I had lost my copy of the press release announcing an award, last June, by the Society of Manufacturing Engineers to Swraj Paul, and that I had to rely on my memory for the details. My memory did not serve me too badly. I did omit the name of the award; it is the 1995 Donald C. Burnham Manufacturing Management Award. I could not possibly remember all of Swraj's many honors and charities, and public service, and they are not all included in the press release, either. His business activities also defy summary. I will merely mention that he has received a Corporate Leadership award from MIT-Richard F. Lacey, secretary, 2340 Cowper St., Palo Alto, CA 94301; e-mail: <rflacey52@aol.com>

to the demanding world of deadlines, but I do

**53** 

Although my appointment as class secretary was officially announced in the July issue of *Technology Review*, this is my very first column. I do not look forward with any delight

look forward eagerly to hearing from the Class of 1953 and writing this column. This will require input from all of you. You can write me, with paper and pen, the old-fashioned way, or you can e-mail me, relatively painlessly, at the addresses below. This has got to be the easiest way to get your news into print!

Marty Wohl sent me a very nice letter, even offering to make my life as class secretary "pleasant." That sounds a wee bit ominous, and with his long tenure in this job, he must know something about it. So Marty, I accept, you are "on." Marty also passed on to me a letter he received from Richard Linde who lives in Cliffside Park, N.J., and most recently managed an H&R Block office in addition to continuing to prepare client tax returns. Dick and Ruth traveled to Arizona last fall and liked the Phoenix-Scottsdale area so much they are contemplating the possibility of a permanent or part-year residence there. They particularly enjoyed Monument Valley and Lake Powell, Bryce and Zion Parks in Utah, which Ruth had not visited before. In October, their younger son, Peter, plans to marry on campus at Columbia University, an undertaking that has fallen on them to arrange.

On the sad side, I regretfully report the death of Stuart Kleinfelter on March 3 following a brief illness. He leaves his wife, Pauline, two children, and two granddaughters. Stuart worked for GTE for 37 years, culminating as VP of GTE Products and as president of GTE Transport, Inc., a subsidiary transportation company.

Bill "Wolf" Haberman reports that he is still busy with city government in Framingham as well as in his position with MITRE Corp. He has been chairman of the Department of Public Works and continues to be very active. In February, he and Berna skied for a week at Vail with Joe Cahn and his wife, Audrey. In May, Bill and Berna visited their son David in Livermore. They have four children and added a granddaughter in March, their first.

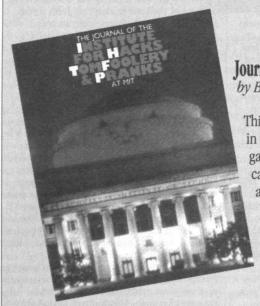
Richard Ahrons, following a successful entrepreneurial career in Silicon Valley, has founded DACON Associates, a consulting firm that specializes in providing an interface between engineers and attorneys in the intellectual property area. He is single, again, and loves living in California for its "craziness and majestic beauty." His three daughters all live in Northern California. Two of them have doctorates, one in medicine and one in psychology. Two are married and have produced two grandsons. He is active in the local MIT Club.

Richard also reported on Alex Gaat (better known to us in 1953 as Alex Gutwurcel) who now lives in Brussels. Alex spent most of his life in Tel Aviv, but went to Brussels for a successful heart transplant four years ago. He stayed on there after the surgery and met and married Shula. Richard is planning to visit Alex and Shula in Brussels in July and will give us a further report.

I look forward to hearing from all of the Class of 1953.—Joe Cahn, secretary, 20 Ocean Park Blvd., #9, Santa Monica CA 90405; fax: (310) 553-0687; e-mail: <imc20@aol.com>

**Hack** \'hak\ n 1: A prank, usually elaborate. v 1: To perform a prank.

2: To explore the places on campus that are not usually accessible. 3: To work at or study a subject not especially for academic gain.



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Please send news for this column to: Edwin G. Eigel, Jr., secretary 33 Pepperbush Ln. Fairfield, CT 06430

Our 40th Reunion was a great success. Reunion co-chairs Joe Saliba and Ted Papastravros and all of the members of the committee did an outstanding job in planning and executing

the reunion. At the class reception at the president's house on Wednesday evening, class president Ed Ehrlich presented MIT President Charles Vest with one of our paperweight class rings. Thursday night in addition to enjoying the Boston Pops, we got to see the Pops' new conductor, 35-year-old Keith Lockhart. At the Technology Day luncheon, our reunion gift co-chairs, DuWayne Peterson and Denny Shapiro presented our class gift of \$3,046,000. Congratulations go to everyone who helped us achieve that total, and expecially to DuWayne and Denny who did such a great job leading the effort. Approximately 90 of us attended some part of the reunion, and 67 went on to Black Point Inn in Prouts Neck, Maine. The accommodations and food were excellent. Those who did not participate in the golf or tennis tournaments enjoyed the Maine coastline, swimming, hiking, sightseeing, and touring the studio and home of artist Winslow Homer.

At the class dinner/dance on Saturday, we elected the following officers to serve for the next five years: president-Joseph Saliba, VPs-Robert Greene, Theodore Papastavros; treasurer-Edward Ehrlich; secretaries-Roy Salzman, James Eacher; class agent-Theodore Papastavros; class estate secretary-Gilbert Davidson. At the dinner we were treated to Les Trompettes, an unusual and prize-winning red wine made by Rubissow-Sargent, and provided by our own George Rubissow. If you want to have some airshipped to you, write to George at 2413 Fourth St., Berkeley, CA 94710 or call him at (510) 841-WINE.

Audrey and Dick Rush celebrated their 40th wedding anniversary by joining son Richard Jr. and his family in Israel. Rich Jr. is a mechanical engineer, like his father, but from Georgia Tech, and he lives in Norway. Dick's other son, Gary, also did not choose MIT-he went to Purdue. . . . David Brooks (Course XIIA) was unfortunately abroad at the time of our reunion on a speaking tour, so thoughtfully reported in prior to that. His new book on water problems in Israel and Palestine came out earlier this year, published by Canada's IDRC (International Development Research Centre) Books; it is entitled Watershed: The Role of Fresh Water in the Arab-Israeli Conflict. David and Toby recently returned from a holiday on the West Coast during which they spent several days with Eldon Reiley at his new home on the top of a cliff overlooking the Pacific Ocean in Montara, and another few days with Marilyn and David Nasatir at their home high in the hills overlooking Berkeleyboth in California.

Lester Lee (Course X) writes that he is still working for the Dept. of Energy, keeping an eye on all those disassembled nuclear weapons and looking for ways to make our nuclear

energy operations safer and more efficient. These activities have resulted in contacts with Russia, Britain, Japan, and France. Lester is among those of us who are still with our first wives (33 years for him), with three childrenall lawyers!-but no grandchildren yet (they're probably all too busy prosecuting, defending, litigating, and making money!). He remains fairly close to a few of his '55 fraternity brothers (AEII) and, at this writing, was looking forward eagerly to attending the reunion.

Duwayne Peterson (Course XV-A) made it into MIT's Spectrum (publication on fundraising and donors) with an interesting story on his decision as to whether to go into professional baseball or to MIT for a different type of education. Apparently he was recruited by the Cincinnati Reds while a freshman at Denison University and playing on their varsity team, and started out in spring training with them. He then thought better of it after a few weeks, gave it up, transferred to MIT (where he was captain of the 1955 MIT baseball team), and the rest is history. Duwayne went on to become a well-known information technology executive at Citibank, then at Merrill Lynch, and now lives in Pasadena where he has his own consulting firm and serves as a member of the MIT Corporation. . . . John Sutton (Course XV-B) retired at the end of 1993 as VP for technology for the Keyes Fibre Co. (now the Chinet Co.), after a rewarding 30-year career developing and improving molded fiber products and processes. Now, in addition to doing some part-time consulting for his company, John and Kati are enjoying opportunities to spend time with their grandchildren, catch up on long-deferred projects at their farm in Belgrade, Maine, and pursue John's interests in railroading. . . . Henry Theis (Course II) is continuing on as VP for marketing and sales with Herr Voss Corp., a Pennsylvania manufacturer of steel and aluminum mill equipment. He says that it never ceases to amaze him that people think that he still knows something about the technology. (Must have been the good education!) He has four grown sons, all of whom are working in the New England area, which makes him a bit envious.

We will share more news of our classmates gathered at the reunion in future columns. In the meantime, please be sure to keep the news coming to us.-Co-secretaries: Roy M. Salzman, P.O. Box 197, Rockport, ME 04856-0197 (please note change of address); James H. Eacker, 3619 Folly Quarter Rd., Ellicott City, MD 21042

### **40th Reunion**

Leon Balents of Honeove Falls, N.Y., is a member of the technical staff of Zecal Co., a division of Varity Corp. He recently presented a paper on patent filing. Leon and Gisela's son has a PhD in physics. For relaxation, Leon

enjoys his garden and fruit tree orchard. . . . Bob Scuer is president of Encoder Design Associations, a consulting company in Clifton Park, N.Y. Bob was president of the Teledyne Curley Co. until 1992, when he left to start a consulting firm that specializes in design of optical encoders and other measuring instruments. Bob and Audrey enjoy chamber music

## ClassNotes

concerts in their leisure time. . . . Barbara and Barry Gordon live in Potomac, Md. Barry is an account executive with the Dynamix Corp. They have two children-Leslie, a CPA, and Craig, a physicist. Barry, who enjoys travel, reading, and discussing politics, has been to Asia, Mexico, and South America.

Joseph Neville retired December 1994 from his position as professor after 29 years of service at Wentworth Institute of Technology (WIT) in Boston. He began in 1965 as an instructor of materials engineering technology and was promoted to professor in 1979. In recent years he has had articles published in Engineering Education, Journal of Engineering Technology and T.H.E. Journal (Technological Horizons in Education Journal). Joe is also a book reviewer for Choice Magazine. He recently released his fifth edition of Historic Hiking Trails in the Boston Area and maintains nine historic trails in the Boston area himself. He is founder of six trails used by Scouts troops.

Professor S. Lael Brainard has been selected to be the next holder of the Class of 1956 Career Development Professorship. Professor Brainard received a BA from Wesleyan University and an MA and PhD in economics from Harvard. He was appointed assistant professor of applied economics in the Sloan School in 1990. Previous to the appointment, Professor Brainard served on the U.S. Council of Economic Advisors. He is the author of many journal articles and working papers, and has received numerous awards and research grants, including both the Council on Foreign Relations International Affairs Fellowship and the White House Fellowship in 1994.

Class of 1956 listsery is now available and class members may subscribe by e-mail to listserv@mitvma.mit.edu> and should include the following in the body of the e-mail: subscribe mit1956. The e-mail address is <mit1956@mitvma.mit.edu>. At the present time, there are 50 classmates on the list.

Sent news to co-secretary Ralph A. Kohl, 54 Bound Brook Rd., Newton, MA 02161; email: <kohl@ll.mit.edu>

The Institute has informed the class that Professor Anne E. McCants has been selected to be the next holder of the Class of 1957 Career Development Professorship. She received a

bachelor's in economics and European studies from Mount Holyoke College in 1984, a master's in economics from the University of California at Los Angeles in 1985, and a PhD in history from the University of California at Berkeley in 1991. She was appointed assistant professor of history at MIT in 1991. She is the author of numerous journal articles and has been awarded several fellowships for her writing and research. She serves on a variety of academic and undergraduate committees. We are pleased to have her carrying the class name and expect to learn more about her work during the 40th Reunion, which will take place in a couple of years.

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We have just learned that Leo F. Hood of Course VI died on November 15, 1993. He had lived in the Reading, Pa., area and had worked for Metropolitan Edison for 22 years. He is survived by his wife, 6 children, and 16 grandchildren.—John Christian, secretary, 7 Union Wharf, Boston, MA 02109

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An inevitable part of the class secretary's job is to chronicle the passage of time as measured by the loss of our classmates. This is especially difficult when it is someone you

have known and worked with through the years. Such is the case with class VP and 35th Reunion chairman Coleman Bess, who died of

cancer on April 30, 1995.

Cole came to Cambridge from Atlantic City, N.Y. He majored in Course X and after graduating married his high school sweetheart, Judy. They spent a year in West Virginia where he worked for Union Carbide. Then they relocated to the Philadelphia area where Cole held chemical engineering positions at Rohm & Haas and Quaker Chemical. During this time he also earned an MBA at Temple University.

Next came the move back to the Boston area where Cole became general manager of Pilot Chemicals until it was acquired by New England Nuclear in 1985. Cole then founded his own company, EM Corp., providing specialized products and services to electron microscopists. He remained active in this business for the rest of his life.

Cole was an enthusiastic, active member of the class, participating in the planning of a number of reunions, and serving as chairman of our most recent, very successful 35th reunion. Just last year he was elected VP of the class and was already deeply involved in our planning for interim regional reunions.

At his funeral, friends and relatives from around the country recalled Cole as a loyal friend with a tremendous sense of humor who took immense pride in the accomplishments of his daughters, Jane and Carolyn. They in turn credited their achievements to his unflagging encouragement to them. On behalf of his classmates, we extend our sincerest condolences to Judy, Jane, and Carolyn.

For 23 years W. Nichols Latham has been the director of Kabeyun, a summer camp for boys on Lake Winnipesaukee, N.H. In 1976, without previously knowing Nick or realizing he was a classmate, we attended a Kabeyun information meeting with our son. Under Nick's guidance, Kabeyun proved to be a special experience that my son was fortunate to enjoy for a number of summers, first as a camper and then as counselor. In a letter dated December 1994. Nick announced that he had asked the Kabeyun Board of Trustees to appoint his successor at the end of the 1995 season, enabling him to become director emeritus. He will spend future summers at camp working directly with the campers. Having personally observed his impact on my son and many others over the years, Nick's ongoing involvement insures that the unique spirit and place that is Kabeyun will continue. His letter concludes with the wish to his successor, "May your Kabeyun stewardship be as long lived and rewarding to you as mine has been to me." Best wishes as well to

you Nick for continued fulfillment in your new role!

Please send news to: Gary Fallick, secretary, 4 Diehl Rd., Lexington, MA 02173

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Please send news for this column to: Dave Packer, secretary, 31 The Great Road, Bedford, MA 01730; tel: (617) 275-4056; e-mail: <70421.1766@compuserve.com>

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And a good—no, great—time was had by all! As I type this, memories of our reunion of a week ago are of many enjoyable times and lots of great conversation, some of it catch-

ing up on what had happened in the past 35 vears. While your scribe missed Tech Night at the Pops and the activities of Thursday evening, Marie and I did participate in the rest of the weekend's festivities, including a relaxing weekend at Stage Neck Inn. About 60 classmates attended all or part of the reunion and, with spouses and guests, we had about 110 enjoying the gathering, which was blessed by perfect weather for all four days. Space and Technology Review policy won't permit a listing of those attending, so you will have to bear with a few of the highlights as I saw and experienced them. Our reunion co-chairs, Bill Blatchley and Tom O'Connor, and their committee deserve many thanks for putting together a memorable occasion.

On Friday, I had breakfast with Clyde Reedy, who has just retired-for the second time-as a science teacher at Riverside Military Academy in Gainesville, Ga. Clyde said that this time it was truly a retirement, unlike the first retirement on completion of a 26vear Army officer career. Also at our breakfast table were Celeste and Bob Eller: Bob now heads his own plastic and rubber consulting firm. (Speaking of Bob, like myself a Course Xer, the chemical engineers were not. as at the 30th Reunion, the most prevalent. Course VI held the honors with 16 attendees. Course X had 11.) After breakfast, Bob, Clyde, and I joined an SRO crowd in Kresge for an interesting Technology Day program on Tech's role in World War II with Doris Kearns Goodwin as the featured speaker. I had recently read Goodwin's Pulitzer-prizewinning book, No Ordinary Time, about the Roosevelt White House during the War. It's a fantastic "read" and I highly recommend it. Unfortunately, for reasons Paul Gray announced as "possible conflict of interest," our classmate and Secretary of the Air Force, Sheila Widnall, was not among the morning's speakers.

The luncheon in the Johnson Athletic Center focused on the reunion gifts. Suffice it to say that for 1960, 43 percent of the class came through in an outstanding manner—as usual—with a one-year gift totaling \$377,000. Included in that amount were contributions to our class project, the Endowment for Innovation in Education, whose total now stands at \$706,000, and which also has financed five class fellows. Many thanks to Noel Bartlett and his reunion gift committee for ensuring that our class goal was met handily. However, the highlight of the lunch for me, thanks to the

foresight of Bob Gurnitz, was being joined by one of our Course X professors, Hoyt Hottel, '24, now 92, and still making it to the office several days a week. Professor Hottel remains active in the field of flame chemistry and is also investigating the phenomena of buckyballs. At our luncheon table were Anna and John Hillier, Penelope and Tim Hart, Richard Levine, and Professor Jack Howard from Course X.

After lunch it was off to Maine. As we were planning to do some additional visiting, Marie and I did not take the bus to the inn. but drove there, reluctantly bypassing hundreds of outlet stores in Kittery-within sight of and easy access from Route 95. A cocktail hour and dinner were the Friday evening activities, with lots of conversation continuing into the wee hours of Saturday morning. One of the discoveries of the evening was that Jerry Hurst and I share an interest in California wines and that we both are participants in the pre-release program of the same small California winery. Jerry is still on the Wharton School faculty, and he and Siri live in Jenkintown, Pa. I also became a baseball card collector Friday evening, getting the card of Fantasy Red Sox, .333 hitter, .450 on-base average, major leaguer Joel Weinstein. As I recall. Joel has been to the Red Sox camps four times and thus, despite living in Carmel, Calif., can truly be certified as a die-hard Bosox fan.

Saturday was a day to do everything from nothing to whale watching. Our activities fell somewhere in between, as, together with Ellen and Bob Gurnit, we drove to Kennebunkport. In our travels we met Angela and Bob Walsh and Helga and Niels Andersen who were enjoying the same sights. As I reported recently, the Andersens are living in Atlanta. I was surprised to learn that the Walshes have left Arizona, as Bob has joined IBM in Essex Junction, Vt., and is now a Big Blue intellectual-property-law attorney. Bob said that he and Angela were looking forward to the cool of Vermont after the last few years of Phoenix heat. As for some of the other activities-no golf scores were revealed-Elaine and Dick Oeler said the whale watching was fantastic; they saw over a hundred, with some of the show-off whales coming to within a few feet of the boat. Linda Sprague (who is now our class "czarina," for reasons that Jorge Rodriguez will have to explain) is still dividing her time between the University of New Hampshire and the UK's Cranfield University. Linda took advantage of the do-what-you-want Saturday to visit the Kittery stores for some much-needed shopping.

Saturday evening's clambake was followed by officer reports and class elections. The most looked-forward-to report was that of the treasurer, Tom Farguhar, who unfortunately was not at the reunion, as he is in Savannah, Ga., getting ready to oversee the yachting events in the 1996 Olympics. In his stead, President Rodriguez gave the treasurer's report, noting that "Everything is okay." End of report. The nominating committee put forward a slate of officers that included reunion co-chairs Tom O'Connor for class president and Bill Blatchley, VP; Jorge Rodriguez, treasurer; Czarina Sprague and Tim Hart as 40th Reunion cochairs; and yours truly again as secretary and class agent. There were no nominations from the floor—although the nominee for secretary noted that input for Class Notes from all those present and voting was a prerequisite for accepting another term. (Please send notes!) The slate was elected unanimously.

The prize for the person traveling the farthest went to Howard Hornfeld, Howie. who is with the United Nations Economic Commission for Europe, came from Geneva for the reunion and left early Sunday to catch a flight home so that he could be off to a meeting in Budapest (from where I had just returned). Sunday morning we bid our goodbyes, looking back on a great weekend and the events being planned by Linda for Reunion 2000. Barry Bronfin and my wife were making a strong pitch for a site somewhere in Provence, but the ever-pragmatic Czarina insisted that we remain within one and a half hours of Cambridge. I'll keep vou posted, as planning progresses. Barry and Cecile are still in Weathersfield, Conn... with Barry chairman and president of Financing for Science and Industry, Inc. In my role as class agent, I continue to be grateful to Barry for his ideas and energy that resulted in our tremendously successful class project-the Endowment for Innovation in Education.

Ray Waldmann was unable to attend the reunion but sent a letter saying that the '60 Phi Delts, together with neighboring classes. had held a mini-reunion in the Florida Keys. Attending from '60 were Sue and Bill Morris. Suzy and Mark Pratt, Dick Julien, Phillip "Fritz" Frink, and Tony Johnson. Ray said he got to the reunion "the hard way, driving my three youngest kids (11, 10, and 7) across country from Seattle in 10 days, meeting my wife, Mary, in New Orleans, and spending a few days on beaches before hitting the Keys. We then sold our van and flew home." (Secretary's note: on a Boeing plane, of course!) Since April 1, Ray has been Boeing's VP for international business.

Finally, at the reunion Ted Kraver again asked me for e-mail addresses of classmates; his is <tkraver@primenet.com>. (Classmates: if you send me e-mail addresses, I will put them in future issues of these notes.) Ted also passed along an e-mail message he had received from Shel Epstein, who can be reached via e-mail at <k9ape@eecs.nwu.edu>. Shel and Suzanne continue to reside in Wilmette, Ill., and are now grandparents of 11-month-old Max Geifman.

David Willis (e-mail: <dawd@chevron.com>) writes from Walnut Creek, Calif., that "with five children through college, we're following the lead of many U.S. industrial firms and downsizing—we're leaving our home of 14 years in Marin County and ultimately relocating outside of Sacramento. Still working for Chevron Corp." . . . Joe O'Connell sends word from Fountain Valley, Calif., that after retiring from Kaiser Aluminum he started an environmental consulting company that has now grown to 50 employees. A family sailing trip to the British Virgin Islands kept him from attending the reunion.

With apologies to those I had a great time with at the reunion but did not mention in this column, I will sign off for now.—Frank A. Tapparo, secretary and class agent, 15 S. Montague St., Arlington, VA 22204; e-mail: <ftapparo@lmi.org>

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## 35th Reunion Robert Griffin died last May in

Robert Griffin died last May in Montclair, N.J. He was a Course VI graduate who had

been working at Smith's Industries in nearby Florham Park. In the 1980s he helped design the telephone hot line from President Reagan to the former Soviet Union. More recently, he won the Old Farmer's Almanac Worldwide Mathematical Prize in 1993 and 1994. I know the class sends its deep condolences to his wife, Jane, and their children, Emily and Andrew.

Bill Hecht sent me this message by e-mail last June: "We are about to start my usual madness just before Technology Day and reunions for '95. I am still here at MIT and we will be all reconvening for our 35th (good God) next June. This year I had the special pleasure of seeing my youngest daughter, Olivia, marching in MIT's 129th Commencement to receive an SM from Sloan. Our oldest son, Bill, is still in the Air Force and was transferred this year to Minot, N.D. Too far for my taste in experiencing grandchildren. We have five. Our other daughter, Maria, is in the publishing business here in Boston. As I begin my 16th year as head of the Association I guess this has become a calling. Olive and I hope to see you all soon."

This reminds me that there is less than a year to go before we crank up another reunion—our 35th! I saw Joe Harrington at Technology Day in June and we began to talk about getting organized. By next month I hope

I can give you a little more information so that you can plan a spring trip back to Cambridge.

Finally, I am delighted to let you know that your secretary is off the unemployment line and is beavering away at Mass. General and Brigham Hospitals trying to keep people safe from various dangerous biological agents.

Please use the e-mail to keep us informed of your doings.—Andrew Braun, secretary, 464 Heath St., Chestnut Hill, MA 02167; e-mail: <andrewb820@aol.com>

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Richard Marks has surfaced relative to MIT after 40 years and is interested in contacting and communicating with classmates in the Philadelphia, Pa., area. Richard is on the

board of the MIT Club of Philadelphia and is interested in setting up an e-mail list for area alumni/ae. He works for Unisys and can be contacted at: <rmarks@tr.unisys.com>. Richard lives in Bryn Mawr, and recently received his radio amateur's license: KE3TL. I expect he can also be contacted via the shortwave bands. . . . Art Funkhouser dropped me an e-mail message that he is searching for classmate Russell Allen Smith whose last know address (via CompuServe) was in Birmingham, Ala. Various efforts to reach him have met with answering services and disconnect notices, so if any other classmates have information on his whereabouts, it would be appreciated. Art can be reached via CompuServe at: <100602.260@compuserve.com>. ... Jean Pierre Frankenhuis responded to my

e-mail inquiry concerning the conspiracy theory of the United Nations trying to take over the U.S. government. J.P. suggests that until the U.S. puts troops in Bosnia, it should not be so critical of the efforts of the U.N. forces there. He does not share the concern of a U.N. takeover of the United States. It seems that my feeble attempts at humor do stimulate an occasional response from I.P., even when my tongue is in my cheek. News seems to get a bit slower in the summer, so if you have a personal computer, please make the effort to find a window to the Internet and telecommunicate with: <mit1962@mitvma.mit.edu>. Alternatively, you can send a message directly to me at: <uabhnm01@asncube.asc.edu>. If you still communicate by surface mail, please send your Class Notes and personal notes to: Hank McCarl, secretary, P.O. Box 352, Birmingham, AL 35201-0352.

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Please send news for this column to: Shoel M. Cohen, secretary, Dept. of Psychology, Nassau Community College, Garden City, NY 11530; tel: (516) 489-6465 (h); e-mail:

<71271.2627@compuserve.com>

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To receive an information packet, contact us

at MIT ProNet, 77 Massachusetts Ave. Bldg. 10-110, Cambridge, MA, 02139-4307,

(800) 758-2437.

I am sorry to announce the death of Joseph Coldwell (Course VIII) of Tulsa, Okla., on April 9. Joseph was a member of the Varsity Crew and participated in the 1964



We connect you with employers from the Fortune 500 to small, entrepreneurial

companies. When companies ask ProNet to

locate alumni with specific skills, we search our database for an appropriate match. Olympic trials. While with the Smithsonian Astrophysical Observatory, he photographed the Apollo Trans-Lunar injection beam. Joseph is survived by his wife, Sherry, and daughters, Katie and Sarah.

Why are Northerners offended when Southerners ask them where they go to church? Why are Southerners offended when Californians ask them what they do for exercise? For answers to these and other provoking questions about cultural differences between North and South read our classmate John Reed's new book Kicking Back: Further Dispatches from the South recently published by the University of Missouri Press (also entitled "Reflections from Behind the Kudzu Curtain").

Robert Saint-Aubin (Course XV) has joined the Reno, Nev., law firm of Maddox and Saint-Aubin. They practice in the area of environmental, natural resource, construction, and

commercial litigation.

Thank you Russell Norris, the second to use the class mailbox. Russell is still in Columbia, S.C., where he teaches theology (religion and science) at the Lutheran seminary. . . but he hopes not for long. A year and a half ago, his wife took a position as VP for finance and treasurer of Wesley College in Dover, Del., so he is in the process of looking for something in the mid-Atlantic area. (Anyone know of an opening for an unemployed theologian-ethicist?) His most exciting news of late is receiving the 1994 Templeton Prize for essays in religion and science (teleological implications of the anthropic cosmological principle) (whew!), which was published as a monography this spring. His daughter, who received a PhD from MIT a couple of years ago, works for Molten Metal Technology in Waltham, as director of technical applications.

Call, write, or e-mail, please.—Bill Ribich, secretary, 18 Revere St., Lexington, MA 02173; tel: (617) 862-3617; e-mail:

<mit1964@mitvma.mit.edu>

This month's column is somewhat shortened by the fact that the column materials arrived the day before we left for a long-planned trip to China! Next month will fea-

ture the 30th Reunion.

Dennis Reinhardt writes that he is an architect at Intel and currently treasurer of both local chapters of IEEE Computer Society and the Hot Chips VII Conference. He has his own web page.

Alan Leslie writes that he is engaged to Rochelle Runnels, a NYC clinic administrator. He is currently living in Brooklyn and president of a small financial and general management consulting firm. He spends his leisure time traveling, gardening, reading, plays, etc. . . . Billy Roessler enjoys being back at Boeing after his five years in San Diego. At the time he wrote, Billy was training for ESPN extreme games due to be held in June. He was due to compete in kiteskiing in a series devoted to alternative sports. . . . Don Smith recently published a definitive guide to Thin-Film Deposition. Don has worked on MBE, e-beam evaporation, sputtering, MOCVD, and PECVD during his many years in the business.—George McKinney, secretary, 33 Old Orchard Rd., Chestnut Hill, MA 02167; tel: (617) 232-4710; e-mail: <georgemck@aol.com>

### **30th Reunion**

Martin McGowan writes that after four years at Bell Labs Wireless he has now moved to

patent work, managing the intellectual property of his lab. He notes that he and John Stampfell recently shared their milestone birth-

days (that would be 50?).

Speaking of milestones, it already time for our 30th Reunion. If you want to mark your calendars now, Tech Week will be June 5-9, 1996. Jim Lash is our reunion gift chair, having to follow the great job Paul Rudovsky did for the 25th. Paul has just moved to Atlanta to become the new CFO and executive VP of Atlantis Plastics, a \$260 million producer of plastic films and molded plastic parts.

Another of our class has been elected to the prestigious National Academy of Sciences. David Chandler, a chemistry professor at UC/Berkeley, was recognized for his distinguished and continuing achievements in original research. . . . From the White House comes notice that the President has nominated Timothy Carney, career member of the Senior Foreign Service, as ambassador to the Republic of the Sudan. Tim was most recently deputy assistant secretary of state for South Asian Affairs. He has been with the Foreign Service since 1967, having served in a variety of African and Asian posts. He was also a member of the U.N. Peacekeeping Missions in Cambodia, Somalia, and South Africa .-Eleanore Klepser, secretary, 84 Northledge Dr., Snyder, NY 14226-4056; e-mail: <vismit66@ubvms.cc.buffalo.edu >

Please send news for this column to: Sharlotte and Jim Swanson, co-secretaries, 878 Hoffman Terr., Los Altos, CA 94024; e-mail: <jswanson@lat.com>

Please send news for this column to: Gail and Mike Marcus, secretaries, 8026 Cypress Grove Ln., Cabin John, MD 20818; e-mail: <76570.2270@compuserve.com>

There's a mixed bag of notes this month.

In a lofty letter received from Jeremy "Jerry" Raines, we hear of unusual flightsdefinitely not of fantasy:

"After nearly 2 years and 150 flight hours, I finally received my private pilot license. This has been one of my most frustrating pursuits. I went through four different flight instructors. Each time when it seemed I was making real progress, the instructor would be hired away by an airline. I'd have to prove my skills anew to each successive instructor. Finally, my fifth instructor, a former Israeli fighter pilot, shepherded me through to the FAA check ride. The net result was it took about four times as long to get the license as it should have. The experience was analogous to being well along on your doctoral dissertation, only to have your thesis advisor leave the university, leaving you

## ClassNotes

high and dry.

"The exhilaration might be worth the frustration. It is extremely satisfying to avoid the Interstates, which are like parking lots here in the Mid-Atlantic region, and to chart your route in pretty much a straight line to be followed at 200 mph.

"One positive benefit to the prolonged instruction is that I already have enough flight hours for the instrument rating, although some of those are the wrong kind of hours. I hope to fill in the gaps, get the rating, and buy a plane. A good used plane costs about the same as a new luxury car. I'd much rather have the plane."

Elizabeth Riordan, nee Grundlehner, who is married to William Riordan, '64, Course XVI-II, writes: "We are thrilled that one of our children, Cathy, will be starting MIT this fall. The kind people in the Admissions Office allowed Cathy to skip her last year of high school to come to the 'Tute one year early.'

Michael Laird has changed jobs again. He is now leading a large UNIX software development group at Xerox in Rochester. He writes, "We build client/server software that operates high-end digital printers used for production publishing. My rock climbing has improved and I've done a few 5.10 level routes."

McDonough Bolyard Peck (MBP), a growing construction management and dispute resolution services firm in Fairfax, Va., last April named Robert A. Gladstone, P.E., as its director of business development, a new position



Robert Gladstone

responsible for expanding the firm's professional working relationships with government and private clients. Bob has had 24 years of business development experience, including work with national firms specializing in engineering, construction contracting, testing and inspection, and mechanically stabi-

lized earth technology. Founded in 1990, McDonough Bolyard Peck has managed more than \$2 billion in transportation, power, industrial, buildings, infrastructure, and underground projects. Bob lives in Reston, Va., with his wife, Jackie, and their children, Sharon and Jeremy.—Eugene F. Mallove, secretary, 171 Woodhill-Hooksett Rd., Bow, NH 03304; e-mail: <76570.2270@ compuserve.com>

From the Boston Pops to Sha Na Na, from our panoramic class picture on the steps of Kresge Auditorium (with Mike Bromberg at both ends) to the closing brunch at 20

Chimneys, the 25th Reunion was wonderful. We're still getting calls, letters, and e-mail notes saying how much people enjoyed being there. And the buzz around the Institute is amazing-and amazed.

Up until a few weeks before the event, it looked like the turnout would be relatively light. But at the last moment, people got tempted. We counted 164 classmates who attended one or more functions, for a 21 percent turnout, which, we're told, "smashed the 25th Reunion turnout record to smithereens.' And boy, was everyone mellow. Our class has aged well.

Probably the biggest surprise was the "Remember Vietnam" session Saturday morning in 10-250. Tony Picardi led off with a show-and-tell on our class statistics. He had everybody in stitches for more than half an hour. (The data is in the front of the reunion book, but Tony made it come alive.) We may have been lost for awhile after graduation, but the more than 150 classmates who returned the survey were a relatively prosperous, contented bunch. MIT has proved a real engine of upward mobility for our class.

Steve Carhart presented his home movie on us and Vietnam. Steve wove together scenes from bombings in Vietnam, the

killings at Kent State, the march on the MIT Instrumentation Labs (Cambridge cops coming from the left, war protesters from the right), the sanctuary for the war resistor, the march on the **Boston Common** (led by pipesmoking provost Jerry Wiesner), and so forth. The quality may have been uneven, but the impact was incredibly powerful. The low-tech equivalent of a time

machine.

Then it was our turn. To break the ice, four of us talked about our own experiences. George Katsiaficas started with the view from the left. As he recalled, he never really got to say goodbye to everyone. He wanted to come to our graduation, he said, but the warden in the Cambridge jail stood on a desk and thundered, "Katsiaficas, this isn't a country club; this is prison." . . . Pam Whitman reminisced about how she and Steve Barr came to paint the dollar bill on the wall around the Cashier's Office in the infinite corridor. . . . Joe Bisaccio, who said he had been collared to offer a counterpoint, recalled that for him, the protests were just an "incredible inconvenience." He said he just wanted to get on with his studies, get an MBA, and start working (full-time). But, he emphasized, that did not

mean he was for the war; he was against it, too. . . . Karen Arenson offered the journalist's perspective, of wanting to observe and explain, in the hope that better understanding would help change things faster.

At this point the audience jumped in. We offer a sampling here. There is also more about this session in the preceding MIT pages of this issue of Tech Review. If you want still more, audiotapes (quality not great) are available for \$10 from the MIT Alumni/ae Association. We did try to make a videotape, too, but failed. Some excerpts:

Eric Clemons: "I decided to come at the last minute to the huge generation support group. Once, I didn't trust anyone over 40; now I don't trust anyone under 30."... Jim Finder: "The events of the spring of '70 weremaybe-an inconvenience. I was not a student activist, but I was not involved in academics either. There was a lot of confusion then for peo-

ple who

Vietnam. We as a world have not learned how to make the world a better place." . . . Jessie Heines: "There are some things we have done better. I have a 19- and a 17-year-old, and one thing that is different is that my kids talk to me, and I talk to them." . . . Rich Edelman: "Certain individuals and generations get near historical events. I think we're still struggling to understand the events we were caught up in. Everything I remember about this place is magnificent-the political experiences, the educational experiences, the people I met. I wanted to take every course; they were all cutting edge. Regrets? Could I have been on a different career path? Yes. But I have no regrets." ... Julie Mazel Sussman: "I wasn't involved in any of this stuff. Though I grew up in a politi-

cally active family, I withdrew, as it all turned violent. It scared me. But at work I find that our age group had totally different attitudes from everyone else, like avoiding military work. The younger people didn't even know what I was talking about."

> tute had a profound effect on my life. I came from a very small town in Arkansas. I was the most liberal person in town. Then I came to MIT and there were many people who were much more liberal. I moved to the right. I didn't have the kind of personal courage that George had. I was on the fringe. Now I'm doing things in a very

> > small way and trying to affect things. I'm very hopeful about our future."

Howie Bluestein: "During the '70s, I didn't know what I wanted to do with my life. I just drifted. I had wanted to work with missiles. Now I study tornados." . . . Peter Cooper: "I was in ROTC during this period. The interesting thing to me is that four out of six of us got out of the program, or flunked, or something. We had to do an ROTC paper about how we could win the war in Vietnam. I did a paper saying we couldn't." . . . Stephen Barr: "I was from a military family. I was really on the fast track-the right track. I really want to thank everybody for getting me off that track. I feel like I had my midlife crisis early. I'm a much saner person as a result."

The session probably could have continued a long while but broke up under the pressure of time. We concluded by remembering those whose lives had been ended by war or in other

Of course, the whole weekend wasn't seri-



watched the video just now with shock

and dismay but also with nostalgia for being

teousness. I have since tried to recapture that

feeling." . . . Mort Hoffman: "I was in the

Sala de Puerto Rico (during Sanctuary), but

wasn't well-connected. A lot of us were very

Mort Hoffman: "We knew we should be

more active. When I looked at that movie, I

knew I was in the middle of it. But when I

closed my eyes and opened them, I knew I

wasn't. Now we have Bosnia and Somalia.

People are dying as senselessly as they were in

confused." . . . George Katsiaficas: "Don't

leave me out of that.'

part of a community that knew truth and righ-

ous. Alan Chapman and his wife, Karen Benjamin, who perform cabaret, gave us our own private performance at the Friday night dinner under a tent overlooking the Charles. They sang of geriatric fatherhood and other relevant topics. We competed in the interclass competitions on a sunny Saturday afternoon: jumping in the sack races, folding and flying paper airplanes, building a quick 2.70style machine, writing haiku and limericks about 8.01 and the Charles, racking our brains in the Knowledge Bowl, and squeezing more than 80 of us into a rope circle with a 20-foot diameter. (We weren't all that thin: there were simply a lot of us, and we built up.) Overall, we came in a very close second to the Class of '65.

We also set a record for 25th Reunion giving. No, not for the amount, but for participation. More than 76 percent of us contributed to the Institute either this year or in the past four years. Thanks to all who contributed. Special thanks to Walt Price, who agreed to match gifts late in the spring from people who hadn't given in the past five years but gave this year. Special thanks, too, to those people who came through at the last minute to push us over the top.

If you came to the 25th Reunion, we know you'll return for the 50th (if not before). If you missed this year, hopefully you'll be enticed to join us in 2020. In the meantime, if anyone who took photos during the reunion is willing to send us copies (to the address below), we'll stockpile them for our 50th Reunion book.

(It's never too early.)

Tony Picardi recently sent in an update: "I have been at International Data Corp. for five years now and was just promoted to group VP, in charge of worldwide software. It's been the most fun job I've ever had! Last year we launched our new boat, *Iolanthe*, a V/80 in Marblehead and attempted to race it under the handicap rule without much success. We await more boats so we can start a one-design fleet. Shirley continues to be involved in reengineering at the MIT Bursar's Office. Don Edwards, '70, will visit in April and we look forward to seeing him and John Eighelberger, '70, at the 25th."

Peace and love to you all.—Karen and Greg Arenson, secretaries, 125 W. 76th St., Apt. 2A, New York, NY 10023; e-mail: <dhbm13d@prodigy.com>

**1** 25th Reunion

Reunion Coming. Our 25th
Reunion, which is considered to
be the "big reunion" is coming
up this summer. Our family is going and I
hope that you will come and bring your family
with you. Our reunion committee will be planning a great event for everyone, so please
make plans to attend.

It is my sad duty to report that Siegfried Mathias died in Littleton, Mass. Sig was the husband of Glenda Ann Mathias. He was born in Munich, Germany, and received a master's and bachelor's degrees in chemical engineering from MIT. He was a consultant for the Arthur D. Little Co. in Cambridge. In addition to his wife and parents, he is survived by two children, Myles and Chrissy Mathias, as well as numerous other relatives. We all

extend our sympathies to Sig's family.—R. Hal Moorman, secretary, P.O. Box 1808, Brenham, TX 77834-1808

I am very sorry to announce that Bob Ebert died in April.
After graduating from MIT, he earned a doctorate at the University of Wisconsin. Bob then had been an associate professor

of psychology at Boston University School of Public Health. He worked extensively with the parents of children with severe learning disabilities, Down's syndrome, and autism, publishing extensively. Unfortunately he had suffered from scleroderma, a hardening and contraction of the body's connective tissues, for the past 10 years. I will remember Bob for his smile, his gentle soul, and his great musical ear. He was an accomplished saxophonist who performed with many jazz and period music groups as well as with the Newton Symphony Orchestra. Many of us in the class benefited from his musical talents when he helped arrange for music at functions for the class reunions over the years. Bob will be sorely missed.

On a happier note, **Ken Kempson** notes that he has worked for General Electric since he left the IRS. He is now the director of Tax Exam for GE Capital in Stamford, Conn. He, his wife, Catherine, and their four children are all living nearby in Wilton.

Our ÜROP Scholarship continues to benefit students. Nina Leko, '95, was given the Class of 1972 Scholarship Award in 1994–95. Her UROP project was at Beth Israel Hospital where she worked in the Orthopedics Biomechanics Lab, and used the work in her senior thesis. She received a degree in mechanical engineering. She was also active as athletic chairperson and steward for the German House dormitory. (The steward orders food and organizes dinners for the entire house.) Nina was also a member of the Armenian Students' Association.

That's all the news for this month. I look forward to your sending news to share. If you want to call instead, the southwest Florida 813 area code has split and my area code has changed to 941. So, the whole number is now (941) 598-4399. However, if the new area code does not work yet for you, continue to use 813, until your phone system or area reprograms to accept area codes that do not have a 0 or 1 as the second digit. My New York number remains (212) 751-8661.—
Wendy Elaine Erb, secretary, 6001 Pelican Bay Blvd., #1001, Naples, FL 33963

Jeffrey Harris is a senior scientist at Oak Ridge National Labs, but the accents he's hearing these days aren't from the Tennessee hills. He's in Cadarache, in southern

France, working on a long-term assignment on a fusion research project. He's still reachable, at <a href="mailto:knarrisjh@ornl.gov">harrisjh@ornl.gov</a> for netters. . . . Tony Scandora has a new baby but the same attitude. He's working at Argonne National Labs in the Chicago area, and still tromboning.

Write or e-mail!—Robert M.O. Sutton, Sr., secretary, "Chapel Hill," 7721 Churchill Ct., Marshall, VA 22115; e-mail: <sutton@smp.pcmail.prc.com>

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Fellow ATO Scott Shlecter writes because he keeps seeing my name at the end of the column (and that's a hint for the rest of you). He's still the head of U.S. operations for

LENALCAR, a management consulting firm. "Tough way to make a buck." C'mon, Scott, don't you live in Beverly Hills?! His kids are now 13, 12, 10, 8, and 6," . . . fun but college expenses loom!" He'd like to see more news from fellow ATOs.

In the continuing saga of how two illustrious MIT grads from the Class of 1974 both ended up in the same small town in Wisconsin, Robert Gahl and I finally got together for lunch. He's a real community activist, currently heading up a 24-hour relay to raise funds for a worthy cause. Due to our meeting, I'm now being invited to join him on the board of the local hospital. ("Dave, have you ever thought about joining the hospital board of trustees?" Now, how would you answer that question?) I'm looking forward to the opportunity to get involved in the community. Bob was proud to say he's made each of the five-year reunions and wishes more of his old chums would, too.

As long as we're on the subject of medicine, another graduate of MIT's pipeline to medical schools, William Kupsky writes that he is chief of neuropathology at Detroit Medical Center. He's also moonlighting as an associate professor of pathology at Wayne State University School of Medicine. Next letter, tell us what's happening in your real (nonwork)life!

This is scary! Mary McCarthy writes, "We will be retiring to Oley, Pa., this summer and undertake the care of a 200-year-old stone house and barn." RETIRING? MARY! You'd better have a good explanation for using that word, like having won the Lotto!

Beverly Carol Wilson echoes what appears to be a common lament, "Still with the same company after nearly 20 (argh!) years, but suffering through severe 'right-sizing.'" While she enjoyed last year's reunion, she was not happy that so many people she knows missed it—shame on you! (Your humble secretary is guilty, too, suffering through some of those same "right-sizing" experiences over the last year.)

Your scribe had the pleasure to attend the Milwaukee Highland Games in May. As a 10th-generation Scot in the U.S., this was a great treat as I've never lived close enough to attend one of these festivals before. Anna, my 2-year-old, made points with dad (but not mom) by falling in love with the music of the 'pipes and dancers. My ancestor who first came to the new world (as a prisoner of the English) had the Gaelic spelling of the name, MacCuithein.

Don't forget to write, and not just trivialities like where you work!—Co-secretaries, David Withee, 3702 Adams St., Two Rivers, WI 54241-1404; tel: (414) 794-1331; Barry Nelson, 65 Hillside Ave., West Newton, MA 02165-2593; e-mail: <br/>
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Please send news for this column to: Jennifer Gordon, secretary, c/o Pennie & Edmonds, 1155 Avenue of the Americas, New York, NY 10036 or 18 Montgomery Pl., Brooklyn, NY 11215

The mails, both electronic and

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postal, have been very slow. Please write—choose a medium. We earnestly need news. From the postal route, Linda Wolfson Kearns writes: "I am currently a communications manager of Lycra brand at the DuPont Co. I have been with DuPont for 11 years, mostly in the areas of marketing research and corporate image. I have 2 children, Emil (5) and Jake (2), and my husband, Jim, also works for DuPont." . . . From Bob Weinberg: "My son, Joshua, just turned 3, and he's the greatest! After spending the last seven years practicing internal medicine, I've decided to return to residency training in family practice, and to receive further training in obstetrics. Since July I have delivered 16 babies! OB is very rewarding. If any classmates are in the area, I would love to have them drop by and go for a swim in our swimming pool in Littleton, Mass. Will see you at the 20th Reunion." If any classmates need Bob's phone number, please e-mail me at <quantalyt@aol.com>. We do not publish phone numbers in the Notes column, but Bob did furnish his. . . . Howard Tanzman has "three children, all boys, ages 3, 6, and 8. My position is director of information services at the American College of Surgeons."

On the e-mail front, word from Phil Giangarra: "I have a home in Mansfield, Mass., with 1 wife (Barbara) and 2 kids (David and Debi), ages 16 and 11. I am working at Motorola designing custom and semicustom VLSI chips. That takes up most of my time, but when I am not working at Motorola, I ride a bicycle (1,000 miles/year), work on my house, and garden. I am also heavily involved in the Jaycees, a volunteer service organization for 21-40 year olds. Since I just hit the big 40 this year, I might have to find another organization for 'older' people. Seriously, I enjoy helping the community, and will continue to do so for many more years. One of these years I hope to ride cross-country on my bicycle. I'll let you know if I get the chance." . . . From Arne Langsetmo: "Seeing as the vaunted Internet has made it so much easier to send mail, I am taking this opportunity to send my first missive to the Tech Review Class Notes ever. Been doing various things in the interim since 1976. First grad school in neurophysiology (four papers, but only degree an ABD), then on to a high-paying (at least at the time) job in computer programming, five years an independent consultant, and finally in 1993, I decided to get a real job and enrolled in law school. Been out here in Berkeley since then at Boalt Hall School of Law at UC/Berkeley. Another 14 months or so and I'll be loose on an unsuspecting planet. Woe be to any Republicans or other subvertors of the Constitution. Feel free to disseminate my e-mail address, and say hello to everyone for me. I just read that Rick Ottolini is out here somewhere, and I know a

couple of other people from other years are here. I see Debbie Lerman occasionally, and saw Fort Felker out here in 1991 or so.'

From Alan Dubin: "In 1983 I started working for the engineering materials sector of Allied Signal, based in Morristown, N.J. My group is called Modulus, referring to the design engineering and technical support service provided to customers of our thermoplastic resins, Capron nylon and Petra polyester. In February 1993, I accepted an overseas assignment to work in our European headquarters in Haasrode, Belgium (near Louvain), to be responsible for our customers in Europe and the Middle East. With wife Mary Anne and daughter Lisette, who was eight months old at the time, we packed up our house and became expatriates. Since then we had a son, Justin, born over here in July 1993, coincidentally a mere 20 minutes after the death of Belgium's former king Baudouin. Notwithstanding, he is still considered a U.S. citizen by the authorities. Living and working in Europe these last two years has been an experience, to say the least, quite different from our past lives in the United States, at certain times quite challenging, and at other times frustrating. Belgium is probably one of the more easy countries to assimilate into, since like much of western Europe, it has been highly 'Americanized.' They have three official languages: Flemish, French, and German, and it helps to speak at least one of them fluently. We started out by studying French and ended up living in a Flemish town, Overijse, with little regret. Nearly everyone educated since the 1950s understands at least some English, so it isn't that hard to get by. Among the more challenging aspects of life here at first involved setting up house with two small infants, finding all the right baby products, especially pediatric care up to US standards (still somewhat of a compromise), and dealing with the local bureaucracy. After battling against Belgian drivers, I'll never again criticize Boston. Once we had settled in and began meeting people, things became easier. Our one major regret is that, while I've been to some exciting places on business, it's been difficult to travel extensively through Europe as a family with the kids still so young. We're hoping this will improve in '95, after which it will be time to repatriate and experience the culture shock anew."

From Michael Jesse Chonoles: "I'll use this opportunity to ask for a correction, last time you published news from me, you had me as chief of meteorology. This was great for a good laugh, actually I'm chief of methodology for Martin Lockheed's Advanced Concepts Center. We offer training, consulting, mentoring, and system integration in the object-oriented arena. We specialize in Rumbaugh's OMT (Object Modeling Technique) and the Booch methodology. It's a fun job as I get to work on progressing object-oriented analysis and design techniques. I've had several articles published and expect to have a regular column in Report on Object Analysis and Design (ROAD) (SIGS Publications) in the next issue. My son, Zev, who just turned 5 in December, takes after his dad (except no beard and glasses). He loves math and reading. Reading way above his grade level, he's also learning how to square numbers. He loves to wear his MIT sweatshirt, and is moving out of his fire engine phase and into planes and spacecraft. My

wife, Susann Schoenberger Chonoles, is a technical writer/editor/communicator currently working at Premier Systems." . . . And from Mark Holthouse: " . . . continue as managing director of Vicorp Interactive Systems in Boston, the company [I] cofounded in 1987. . . expecting [our] second child in June." Unfortunately, Mark has not sent an update since this initial note. . . . From Lawrence Stewart: "I'm now CTO of Open Market, a startup in the area of Internet commerce. The chairman is David Gifford. We've tripled in size since December, and are now up to 52 people. Offices in Cambridge-doesn't everyone eventually return?" . . . As for your secretary, he continues to plug away. Please send me news of your doings for our column. We need it .-Arthur J. Carp, secretary, Quantalytics, Inc., 220 Henley Rd., Woodmere, NY 11598-2523; tel: (516) 295-3632; fax: (516) 295-3230; email: <quantalyt@aol.com>

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Please send news for this column to: Ninamarie Maragioglio, secretary, 9727 Stipp St., Burke, VA 22105

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Please send news for this column to: Jim Bidigare, secretary, 9095 North St. Rd. NW, Newark, OH 43055-9538; tel: 9614) 745-2676, fax: (614) 745-5648

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Louis Cohen is a principal consultant for Oracle, designing and building database applications. He writes, "I spent six months last year working out of the Mexico

City office, tuning clients' applications and working completely in Spanish. I now live in the San Francisco suburbs with my wife, Rebecca, our cat, and two dogs who followed me home." . . . Paul Stipe is now a lieutenant colonel in the Air Force, currently stationed in Utah, "working on a project to shut down a base in Central Ohio. Never a dull moment as the Department of Defense tries to adjust to an austere budget!" . . . Becky Waring is "still in San Francisco and loving it, despite quakes, fires, floods, and other natural disasters. For the last few years, I've been executive editor of NewMedia Magazine, a high-tech mag devoted to multimedia and the information superhighway. Would love to hear from other classmates in the Silicon Valley." . . . Paul Braisted has "recovered quite a bit from my private airplane crash on November 22, 1993. I'm back at work full time, designing GPS receivers for Trimble Navigation."

This month seemed to bring out many of you with unusual extracurricular activities. Robert Gompf is a full professor at the University of Texas at Austin in mathematics. He does international folk dancing and dances with a Hungarian performing group. . . . Since 1982, Henry Fiorentini has been president of Panatech Computer Management, which provides software and network services to businesses. He has two sons (ages 2½ and 1), and two houses (ages 40 and 5!). In his "spare time," he plays ice hockey. . . . Michael Raphael is living in Bucks County, Pa., with

his wife, Joanne, (Wellesley '81) and his two children, Ross (8) and Leigh (5). His architecture practice, Raphael Syphers Architects, has continued to grow since being established in 1988. They are currently working on several private schools, banks, and residential projects. He plays soccer in an over-30 league.

That's all for this month. Drop me a line and let me know what wacky pastimes you have been into lately.—Sharon Lowenheim, secretary, 98-30 67 Ave. #6E, Forest Hills, NY 11374

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Please send news for this column to: **Kim Zaugg**, secretary, 549 Fairfield Rd., Canton, MI 48188; tel: (313) 981-1785; e-mail: <vayda@erim.org>

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### 15th Reunion

Lots of first-time writers this month (at least to me), and one class officer with blessed news.

It's a Boy: Congratulations to Marc Chelemer on the birth of son Daniel Seth this past May. Young Daniel weighed in at 8 lbs., 2 oz., and joins sister Micaela and mom Carol Shansky.

Heavy Metal: Thomas J. Misa is associate professor of history at the Illinois Institute of Technology in Chicago, and has just written a book, A Nation of Steel: The Making of Modern America 1965-1925 (The Johns Hopkins University Press). Here's an excerpt from the jacket notes: "From the age of railroads through the building of the first battleships, from the first skyscrapers to the dawning of the age of the automobile, steelmakers proved central to American industry, building, and transportation. In A Nation of Steel Thomas Misa explores the complex interactions between steelmaking and the rise of the industries that have characterized modern America. A Nation of Steel offers a detailed and fascinating look at an industry that has had a profound impact on American life.'

Golden Gaters: Carol Julin and family have moved to San Francisco last fall and are now living close to Golden Gate Park, the ocean, and lots of Chinese restaurants. They're trying to take advantage of the benefits of city life, but also enjoy activities such as cross-country skiing, rock climbing at Yosemite, cycling in the wine country, and sea kayaking in the bay. When Carol's not having all that fun, she's working as a lab manager in the Preuss lab in molecular neuro-oncology at UC/SF.

Good Vibrations: From the wilds of central Pennsylvania we learn that George Lesieutre has "made partner" (i.e., gotten tenure) at Penn State, where he is associate professor of aerospace engineering as well as associate director of the Center for Acoustics and Vibration. George also recently earned an instrument rating on his pilot certificate. Sons John, 8, and Willie, 6, are at the point of taking an interest in baseball, so George is about to enter a new phase of life: Little League Coach. By the way, George also tells us, his kid brother Bernie is now an assistant professor of electrical engineering at the Institute. George can be reached electronically at <g-lesieutre@psu.edu>.

On, Wisconsin: Susan E. Babcock is assis-

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tant professor of material science and engineering at the University of Wisconsin/Madison. Susan has two children, Brett Edward, 4, and Sara Rois, 2.

Back at the Yard: Linus Yamane and wife are back in Cambridge after these many years and are now living at Harvard, where they are resident tutors in economics. Linus is also teaching economics at Wellesley. He can be reached by e-mail at <lyamane@lucy.wellesley.edu>.

That's the news for this month. Hope you're all making your plans to attend the reunion next June. And of course, remember the Class of '81 Room 10-280 renovation project! Every dollar counts.—Mike Gerardi, secretary, 3372 Olive St., Huntington Park, CA 90255; tel: (213) 587-2929 (h), (310) 203-8080 (w); fax: (310) 203-0567; e-mail: <mmg@jmbm.com>

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In June, John Blake at MIT set up a class e-mail distribution list called 1982 List Serv. The list will be used for communicating to the class about reunions and other informa-

tion of interest to the class. As class secretary, I have the ability to distribute stuff to you. I received a message from someone who has a career opportunity for people interested in the financial services industry. I may send that type of stuff to you as well when it comes my way. I can also send you a copy of the Class Notes about three months prior to what you will read in Tech Review. If you want to have your e-mail address added to the list, please send John Blake a note. His address is: <mitalum@mitvmc.mit.edu>. If you send me Class Notes by e-mail, please keep them to the point. It makes my job (and TR's job) of editing easier. Also keep in mind that our space allocation in TR is limited. Do send notes!

Alex Slocum finished a PhD in 1985 and worked at National Institute of Standards from 1983-1986. He was then a MIT civil engineering robots professor from 1986-1989. After that he went to England in 1989 as a visiting machine tool professor, then played machine designed consultant in 1990, and came back to the ME Department in 1991 to do precision machine tool research and teaching. The department blessed him with 2.70 responsibility last spring, and the Pi Tau Sigma folks (he is their faculty advisor) saved him with herds of undergraduate helpers. This summer he is trying to get everything ready (kits, contest, notes, problem sets) for next year to avoid a clustering of ducks. He just earned tenure, so it makes him feel more concerned about making the teaching perfect, as the research kinda naturally flows at this stage of hair loss. Alex found time to fall in love and marry Debie who is an MIT EE and a karate instructor. They have three power nerd micromunchkins that love to play nerd games (mathblaster, etc.) on the Macs. Even the 2.7year-old is really good. The two older boys are also into martial arts. The oldest tests for his junior black belt this summer. They all love to ski. Alex has been skiing for 30 years, and last

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Of Counsel John L. Welch Milton M. Oliver year his 8-year-old forced him to try snowboarding.

Lloyd Bloom and his wife, Christine, are expecting their second child in September. They met Win Cody and his wife, Linda, at Sesame Street town in eastern Pennsylvania with their two children. A great experience for anyone from the New York/Philadelphia area. Win and I have talked about starting a business on the Internet. Drop him a line at <br/> <bloom@i-2000.com>. Win Cody's e-mail: <win\_cody%the\_copeland\_companies@notes.</p> world.com>. . . . Donald Zebrose is married to Kate Lambert, '83, and they have two wonderful children, Alexander (6) and Cordell (4). ... Rita Nothaft-Fordiani and Alfred Fordiani announce the birth of their daughter, Jillian Johanna, on April 13, 1995. Alfred is currently a high school science teacher and varsity baseball coach at Nashoba Regional High School in Bolton, Mass. Rita is happy working as an environmental engineer at CH2M Hill in Boston. Mountain climbing trips are on hold for this summer while Jill gets a little older.

We have tragic news to report this issue: two classmates were killed during a mountain climbing expedition in Alaska. Philip Kauffman and Steven Carroll, '84, made the first known ascent of remote Mount Orville in Alaska. They reached the peak and were killed by an avalanche on the way down. They were in radio contact with other climbers. Their bodies were found near their base camp. They had been climbing together since their MIT days and had climbed some of the toughest mountains together. Steven worked for Arthur D. Little in Cambridge and was a member of the Big Brothers/Big Sisters of America Association. He had been a mentor to a Woburn boy. Philip was a veterinarian and is survived by his wife, Vikki.—Helen Fanucci, secretary, 502 Valley Forge Way, Campbell, CA 95008; tel: (408) 370-1098; e-mail: <fangroup@aol.com>

By the time you read this, astronaut Caty Coleman may be in space. Caty is scheduled to fly on Columbia for space shuttle mission #73 in late September. The mission is

scheduled for 16 days and is primarily devoted to physics experiments, which will take place in a laboratory in the shuttle bay. I saw Caty recently for a pre-flight briefing on faxing in a note for our column from space. She is a remarkable person who is smart, modest (when asked her occupation, she tells people she is a scientist), genuinely friendly, and just a pleasure to be around. We wish her safe travel on her mission.

The following information comes from Hyun-A Park. Athena Edmonds and her husband, Penn, are designing a home in Belmont Hill, Mass., and look forward to moving in with their daughters, Lynn, Zoey, and Nikki. ... Dave Weinstein and his wife, Deborah

Winchester, Mass. Dave works for Mercer Management. . . . Paul Nahass is now working for Albany International in Mansfield, Mass. . Mike McConnell and wife Leena had a baby girl named Kelly in April 1995. Mike is a

Hernandez, are renovating a carriage house in

cardiologist at Brigham & Womens Hospital and lives in Newton, Mass. . . . Dawna Levenson was just made partner at Andersen Con-

sulting. Dawna has worked at Andersen since graduating with a master's in 1984.

I had a party last week hosting Hyun-A Park, Gardell Gefke, Bob Grimes, and Javier de Luis. Bob and Javier both work at Payload Systems in Cambridge where Bob is working on some novel experiments growing plants in space. Gardell is at the University of Maryland where by day he is working at the space systems laboratory. Gardell recently arranged a paintball outing for a bachelor party which, aside from the poison ivy and the direct shots to the head, was actually quite fun.

Finally, I am pleased to announce that Yulan Liao has received the Class of 1983 student aid fund. She is a junior from San Francisco and was born in Canton, China. She is a chemical engineering major who plans to pursue an MD and a career in medicine and bioengineering. Yulan volunteers as a tutor on campus and in the Boston Asian community. She has done a UROP on "characterized genes whose expression is differentially regulated by electrical activity within the muscle fiber.' Yulan is a member of the MIT Women's Chorale, enjoys intermediate tennis, pingpong, and is the news editor of the Council of Chinese Affairs Publications, through which she has won prizes for her writing. Thanks to our classmates for their generous contributions that enabled this award.

Please keep those cards, letters, and faxes coming!-Jonathan M. Goldstein, secretary, c/o TA Associates, High Street Tower, 125 High St., Suite 2500, Boston, MA 02110; fax: (617) 574-6728

Julie (Goddard) Weatherby proudly announces her 10th wedding anniversary to Gerard Weatherby, '82. (Actually, by the time this appears in print, it will be 11 years!) She

provides this update: "Our daughter, Kate, is now seven and showing signs of being an alien (to us) cheerleader type, as well as being appropriately intellectual. Gerard is working as a computer programming consultant to Aetna. I've been working in HVAC (heating, ventilation, and air conditioning) design and construction for buildings, most recently joining Columbia Power Systems, consulting engineers in Glastonbury, Conn., in charge of mechanical engineering there." . . . And this just in from David Karlin: "I've spent nine years as a test engineer for Freighliner Corp. My wife, Hanna (DMD), now has a thriving dental practice. We have two daughters, Moriah (9) and Orna (5)." . . . Charles Carr writes in to tell us that he is now working for Buck Consultants as an associate consulting actuary. . . . Jeff Friedman has finished his pediatric residency and is starting a hematology/oncology fellowship. His wife, Jenni, has likewise completed her residency in neurology. They have a son, Noah, and a dog,

up the yard. Finally, it is with sadness that I report the unfortunate death of one of our classmates, Steven Carroll, on April 24, 1995, while descending from the top of Mt. Orville in Alaska. Steven and two friends (including Philip Kauffman, '81) had culminated a 15year climbing partnership by being the first known climbers to reach the 10,495-ft. peak

Amber, who both occupy their time digging

overlooking Glacier Bay in the southeastern part of the state. On this, their third attempt, the three started their ascent from a base camp at 5,000 ft. and made it successfully to the top. However, a foot of fresh snow had fallen the day before, and the unseasonably warm temperatures apparently made the snow unstable. About halfway down their descent, the climbers were caught in an avalanche that carried them 2,000 feet down. Steven worked as an engineer at Arthur D. Little, Inc., in Cambridge. He was also a three-year member of Big Brothers/Big Sisters and had worked as a telephone counselor for the Samaritans. Always seeking adventure, Steven had twice crossed the U.S. on motorcycle. His climbing experience included Half Dome in Yosemite and various peaks in Europe and Ecuador. Steven was a member of Theta Chi Fraternity at MIT. - Jonathan Miller, secretary, 1708 Plaza Ct., Mountain View, CA, 94040; tel: (415) 961-2394; fax: (415) 813-1130; email: <diamonds@well.com> or <jonathan\_miller@logitech.com>

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Please send news for this column to: Bill Messner, secretary, 5927 Alder St., Pittsburgh, PA 15232; tel: (412) 361-4180; e-mail: <br/>
cmu.edu>; listserve: <mit1985@mitvma.mit.edu>

86

### **10th Reunion**

Congratulations—thanks to you, this column includes a record number of submissions

and listings about Class of '86 alums. We are also pleased to announce that we now have our own '86 MIT e-mail address and mail list. See below for more details. Now, the news.

David (Greg) Milli is working for Price Waterhouse overseas in Moldova, which I am told is somewhere in the vicinity of Russia and Romania. . . . Marc Friend graduated from Harvard Business School last year (June 1994) and has moved back to California to join U.S. Venture Partners. "I spend my time looking for great West Coast (mostly) start-ups in software, communications, and semiconductors. I would love to hear from any classmates in start-ups looking for capital."... Carla Fermann recently got engaged to Chris Van-Haren, '88. They are thinking about a January 1996 wedding, but haven't done much planning yet. Carla is still working at MIT, overseeing Athena Consulting.

Grace Judy (Saccardo) and her husband, Mike Judy, '87, are both doing well in North Andover, Mass. Grace is at Hewlett-Packard, and Mike is at Analog Devices. . . . David Anderson is continuing work on the International Space Station with McDonnell Douglas. His group recently completed neutral buoyancy testing at NASA JSC in Houston. . . . Ellen Wheatman (Spero) in Pennsylvania has a new baby, Brian, and a new job, at Sybase.

Gordon Shaw writes from Hong Kong, where he is working for AIG Investment Corp. Gordon mentioned other MIT alums in Hong Kong include John Lin, who works with him at AIG, Bernard Teh, who works at DLJ (also in investments), Lulu Tsao at Intel, and Ruth

Schindler (Shyu), '88, who is with Anderson Consulting along with her husband, Peter Schindler, '89. Gordon also keeps in touch electronically with Evan Wang back in the states.

Buzz Moschetti writes from New York City with lots of news about himself and many other alums. He is currently a managing director in the mortgage department at Bear, Stearns, & Co., designing and creating bond portfolio analytics systems. "The work is exciting and the hours aren't bad anymore; the 14 hour days stopped a few years ago." Buzz got married in 1992 and now has a 10-month-old son, Paul III. ("Paul, Jr." is Buzz's real name.) He was initially concerned about starting a family in NYC, but the city makes it easier on him and his wife, Chuen, because you can "do 'anything at any time' within walking distance; simply drop the youngster into the stroller and you're on your way." When he's not working or performing fatherly duties, Buzz manages to find time to write and record tunes (along with Felix Partow, '87). He's now into the "fitness lifestyle thing" so he's also cycling and running now. "It's a good thing Central Park is two blocks away from our apartment."

Continuing with Buzz's news, Howard Stearns got married in February 1990 to Robin Larsen, '85. They now have a two-yearold daughter, Shannon Emily, and another on the way, due in September. Howard and his family live in Racine, Wisc., and he is doing EE work for Elwood Electronics, makers of, among other things, synthetic diamond presses and control equipment. . . . Boris Yost married Lynn Gifford (WILG) in August 1993 and they now live in Ithaca, N.Y., where Boris is a lab administrator for Cornell. They're expecting their first child in January. Buzz sees plenty of other MIT alums including Felix Partow, who is a CMO strip trader at Smith Barney; Rick Smith, '87, who is a derivatives analyst at SwissBank; Neal So, '91, who works in Buzz's group at Bear; and Christine Le Viness, '89, who is also at Bear.

Greg Harrison's biggest news is that he recently became engaged to "the wonderful" Nichole K. Mihara. No date is set yet, but they expect it will be in June 1996. Greg is still working at JPL on the Galileo spacecraft orbiter engineering team. As of this writing, on July 13, they were to have sent commands to release the probe from the Galileo orbiter. In December the probe will transmit data to the orbiter as the probe enters Jupiter's atmosphere. A two-year exploration of Jupiter and its moons will begin on December 7, when they perform the Jupiter Orbit Insertion (JOI) burn. Outside of work, Greg is still spending lots of time working on comedy/acting skills. He recently completed the intermediate level of instruction at The Groundlings, and is also a member of the comedy improv group, The Legitimate Freaks. They perform frequently in the Pasadena and West Los Angeles areas, and were even named "Comedy Pick of the Week" in a small local newspaper.

Shawna Vogel just had a book published, Naked Earth (Dutton, 1995). "It's a kind of journey to the center of the earth through the eyes of geophysicists—i.e. how researchers see into the earth's innards and what they see." One of the noteworthy testimonials on the bookcover reads, "Vogel's precise and visual

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Ø/

First, some of you might have experienced deja vu while reading the August/September column. There was an e-mail mix-up which caused a piece of the July column to be

reprinted in place of the new column which had been prepared. The material intended for last month will be printed in the November/ December column.

Next, I would like to introduce you to Jon Yi, '97, who is the first recipient of the Class of '87 (yes, that's us!) Student Aid Fund Award. Hailing from Great Falls, Va., Jon is a sophomore majoring in computer science and engineering. Besides excelling academically, Jon served as a tutor for introductory physics last year while still a freshman. Over the summer, he worked as a computer programmer at the Naval Research Laboratory in Washington, D.C., and hopes to pursue his education at least through the master's level. Jon also actively participates in extracurricular activities. He is a member of the MIT Symphony, and also plays intramural ice hockey and vollevball. Many thanks to those of you who have contributed to this fund! Hopefully, Jon is only the first of many students who will benefit from the generosity of our class.

Brett Gaspers left a marketing position at Syntex Laboratories in Palo Alto last year, and

prose conjures up startling pictures of a vast underworld on an exhilarating journey to the center of the earth and back." Shawna says that the book can be found in most bookstores, or you can write to her in Jamaica Plain, Mass. . . . Brian Eberman finished a PhD in mechanical engineering last February, and after a very short post-doc at the MIT AI Lab, joined Digital Equipment at their Cambridge Research Labs to work on spoken language systems research. On a personal note, his wife, Margaret, gave birth to a wonderful, healthy baby girl, Catherine, last March.

The U.S. Navy informs us that Renton Carsley recently returned to Norfolk, Va., after completing a six-month deployment with Fighter Squadron 32. His squadron, aboard the USS Dwight D. Eisenhower, departed in late October as part of an 11-ship battle group. During the 44,000 mile deployment, tactical Navy planes from Renton's ship flew nearly 19,000 hours accident-free, and completed over 2,500 combat support sorties over Southern Iraq in the Persian Gulf and near Bosnia in the Adriatic Sea. During the 140 days at sea, the squadron also visited France, Greece, Israel, Italy, Spain, Turkey, and the United Arab Emirates.

Now for the information about our new Class of '86 e-mail list, being maintained by MIT. Regular analog U.S. mail is still perfectly fine, but if you're equipped with an Internet connection, you can now send in submissions to Class Notes at:

mit1986@mitvma.mit.edu>. Your individual submissions are not automatically forwarded to everyone on the list—they are first compiled for this column, and then a copy of the column is sent off to the list. If you have any news, suggestions, or comments, please pass them along.—Bill Hobbib, secretary, 5 Cappy Cir., West Newton, MA 02165; e-mail: <mit1986@mitvma.mit.edu>, or <billhobbib@aol.com>

started a consulting firm called Objective Insights with two former Syntex coworkers. Their timing was fortunate, as they were established by the time Hoffman-LaRoche bought out Syntex. Objective Insights concentrates on business analysis, primarily helping pharmaceutical companies to make better decisions regarding their business opportunities. There is apparently a demand for this type of service, as O. I.'s client list has rapidly grown to include Merck, Genentech, and many other well-known biotech companies. Although his company is based in the Bay Area, Brett moved to Seattle in March to start a Northwest office (partly to better serve clients in that area, and partly to get back to his home state). Brett timed the move to coincide with his wife's (Pam Barrett Gaspers, '90) completion of a PhD at Stanford. They are now looking for a house in the area, and trying to keep their four cats out from underfoot.

Speaking of cats, I got e-mail, allegedly from "Jed the Cat," who lives with Greg Hancock. I include the note with only slight changes: "Greg Hancock: still with Monsanto Chemical, fibers division, Pensacola Florida Technical Center. Making the world safe for nylon. Currently divorced. Greg and I are building a shrine to Frank Zappa. When it's done, you're all invited down for the party. Greg works in the pilot plant. He makes fibers. He runs tests. He analyzes data. He writes reports. He goes to work wearing T-shirts and ripped jeans. Whether or not you work for the government or in private industry, and whether or not your life sounds like Ozzie and Harriet, you have not truly lived until you suck crawfish heads. That's life on the Gulf Coast." Greg can be reached via e-mail at <zappafreak@aol.com>. . . . Andrea Ghez is enjoying her new tenure-track position in the Department of Physics and Astronomy at the University of California/Los Angeles. In April, Andrea had the pleasure of going on her first trip to the Keck Observatory. Working there with several students reminded her of the wonderful experiences she had as a UROP student at MIT.

Grace Ueng Trombetta moved back to Minneapolis last fall. She is now working for MECC, a children's educational software publisher, and is managing the marketing of CD-ROM titles for the home market. . . . Steven Wheatman and his wife, Ellen Spero Wheatman, '86, had a second son, Brian, on June 6, 1994. Ellen recently changed jobs, leaving Oracle to join Sybase in Philadelphia. . . . Sooji Lee finished her residency at Harbor-UCLA in internal medicine, and is now working in the D.C. area. . . . Sharlene Liu just finished a PhD at MIT in electrical engineering, and is spending the summer at BBN in Cambridge, working on Mandarin speech recognition. She will then take a six-week tour of Europe (Iceland, Sweden, Russia, Holland, Switzerland, Spain) for both business and pleasure, before flying off to Taipei, Taiwan, for a one-year postdoc, also in the area of Mandarin speech recognition. . . . Finally, I regret to inform you that Julia Lynn White Chrey died on August 9, 1994. Julia majored in physics and humanities while at MIT. She married Bryan Chrey in April 1993, and at the time of her death was living in Seattle. Classmates who want further information may contact me. Well, as you can see—I print what I get! So send your update to: Jack Leifer, secretary, 2908 Roses Run,

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I am leaving for Greece today and writing this column is the last thing I have to take care of before getting on the plane. I admit that the temptation to skip this issue was great, just

like the last problem set due before spring break. Heather Patrick recently received a PhD in physics from the University of Colorado/Boulder. This summer she will marry David Newell who is also a CU physics graduate. They plan to move to the Washington, D.C., area, where Heather will be looking for a job in the field of fiber optics. . . . John Vassey retired from DOD and became a staff member at Cleveland State Community College. . . . David Silldorff writes that he is still in the Navy and that he caught a nice chinook salmon on his boat the C-Dorkk (It is a C-Dory). He also writes that Chris Saito is having fun at Stanford B-School and that Todd Abler just arrived for Navy squadron training as an EA-6B pilot. Todd used to be an A-6 bombardier. . . . Alison W. McCarty is working hard (but having fun). She incorporated her own business last fall. The Wren Group helps emerging technology ventures in the U.S. and Eastern Europe. Their first contract was signed with an MIT physicist doing business in environmental remediation. . . . Steve Beaudoin had two pieces of good news. First, Mark Hanson has successfully defended an aero/astro PhD at George Washington University! Second, Steve has accepted a faculty position in the Chemical, Bio, and Materials Engineering Department at Arizona State University, starting in the fall of 1995. He will defend his thesis for a PhD at N.C. State (in Chemical Engineering) sometime this summer. Steve writes "It has been a long, strange trip, and I'm not exactly sure how I got here, but I'm real excited to be finishing my doctoral work and moving on to a new career." He wants to continue doing research on environmentally-friendly chemical manufacturing.

Ernest Prabhakar quotes "The time of my departure has come. I have fought the good fight, I have finished the race, I have kept the faith..." (2 Timothy 4:6–8). He also writes "It is finished! Thanks be to God! After two months of writing, three years of research, seven years of Caltech, eleven years of higher education, and twenty-two years of schooling, it is all over. My thesis is done, defended, and signed." Ernest will receive a doctor of philosophy in experimental particle physics and has decided to go into management consulting with Boston Consulting Group.—Catherine Suriano Singer, secretary, 131 Main St., Andover, MA; e-mail <singer@mit.edu>

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Greetings! This summer has been very slow for news, so I hope that you'll write in about your vacations and other goings-on.

This month's list of people to please send news is: Zake Aslamy, Agnes Gapud, Ketan Kapadia, Herbert Miller, Peter Wong, and Linda Yeh. What are y'all up to? If anyone knows about any of these people or anyone else, please write in.

Anyway, on to news.... Kevin Li graduated this June with a PhD from MIT, and has relocated to San Diego to start working for PCSI.

I spied Class Ambassador Toon-King Wong's photo in Wired magazine this summer, in an article on TK's Internet business in Singapore. TK's SilkRoute Ventures was billed as the hip Internet consultancy business in Asia.

One-year-old Brian has been keeping parents Greg Tashjian and Amy Bourassa quite busy. Amy returned from her leave of absence to her residency training in July. Greg and Amy often see Kristin (Slanina) Schondorf, her husband, Steven, Jennifer (Hamel) Jones, '91, and her husband, Joe. Greg also keeps in touch with Vit Vasista.

Tim Sulzbach stopped down to visit over the 4th of July, where he, Derek Chiou, Andy Shaw, and I managed to get together for dimsum. Former roomate Sam Druker and wife Anna, SM '91, couldn't make it as he recently moved to Palo Alto to work for Cygnus, where he is now a VP. Anna started work at McKinsey in San Francisco this summer. Tim is working for IBM in Burlington, Vt., and has been competing in various triathlons, having worn the number "8" in the last triathlon he ran. Derek, Andy, and I are still here at MIT trying to finish up our theses.

Since graduating from MIT, Poh-Hin Lim has spent two years working in a lab at MIT before going through medical school at Columbia University. Poh-Hin recently graduated from Columbia and will begin internship at the Jewish Hospital of St. Louis before doing three years of neurology residency at Washington University Medical Center in St. Louis.

Poh-Hin reports putting up a Web page: <a href="http://walden.mo.net/~philemon/index.html">http://walden.mo.net/~philemon/index.html</a> which contains "a few pictures of me, a very short audio recording, several interesting links, a do-it-yourself (Newton battery pack) page, and a worldwide Malaysian restaurant list compiled by Willie Lim from MIT. Not too impressive (but, then again, I am a Course VII person); just something I whipped up during my final months in med school between my internship interviews."

Poh-Hin's and other class members' URLs are available through our Class Homepage listed below.

Well, that's it again for this month. Please send in news!—Henry Houh, secretary, 4
Ames St., Cambridge, MA 02142; tel: (617)
225-6680; fax: (617) 253-2673; e-mail: <a href="mailto:khh@mit.edu">khh@mit.edu</a>; Web site: <a href="mailto:khtp://www.tns.lcs.mit.edu/mit89/">khtp://www.tns.lcs.mit.edu/mit89/</a>

I'd like to introduce myself to you as your new class secretary: I'm Max P. Ochoa, I lived in Baker House, was a member of the water polo and swim teams, assistant wom-

en's water polo coach, and an avionics major. I hope to continue Ning Peng's excellent work during the next five years.

We had a fantastic reunion this June and there is much to tell you. The class has new officers: Eric Miller, president; Ayisi B. Makatiani, VP; Max Ochoa, secretary; and Charissa

## **ClassNotes**

Lin, treasurer. We also have a large and enthusiastic group of members-at-large whose names I'll publish in the next issue. We all wish the outgoing officers the best of luck and congratulate them for a job well done during their tenure. They are: Joe Babiac, Stacy Feldman, Ning Peng, and Mark D'Agostino. Outgoing members-at-large include Meryl (Alford) Miller and Joanne Spetz both of whom did a great amount of work for the reunion.

Any of you who, for whatever reason (graduated early, late, etc.), are not officially part of the Class of '90 but want to be affiliated with it can call Alumni Records at (617) 253-8270 and they will gladly take care of that. Affiliation means that you will get class-specific mailings and information. Now for the good stuff! In no particular order and with apologies to those left out: Alex Chen is working at



Alex Chen

GE CR&D after picking up a master's in mechanical engineering at University of Michigan where he and I had opportunity to hang out. . . . Karen Foo has turned into a true outdoorswoman. So much so that she missed some reunion events to do some wreck diving! . . . Vijay Krish has finished his first year at

Harvard Business School and is in NYC for the summer at Morgan Stanley. . . . Similarly, Desmond Davis has finished his first year at University of Texas Business School and is working for Merrill Lynch here in NYC. By coincidence, he and Vijay are living in the same building in the Village. . . . Christina Holcroft is pursuing a PhD in biostatistics at the Harvard School for Public Health. . . .

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TECHNICAL SPECIALISTS Catherine J. Kara, PhD Mark D. Russett Isabelle Clauss, PhD Ivana Magovcevic, PhD Renata Pomponi is getting a PhD in the Technology and Policy Program at MIT. . . . Susie Wee is chasing after a PhD in HDTV in Course VI at MIT. . . . Allison (Hochstein) Jaynes and her husband, Scott, also attended the reunion.

Vijay Vaytheeswaran will either inspire you or crush your will to live; he is bureau chief of Latin America for The Economist and has had the privilege of a one-on-one interview with Fidel Castro. . . . Boris Golubovic is pursuing a PhD in EE at MIT. . . . Maureen Kenneally has been a practicing vet for a year and is learning the subtleties of husbandry (just ask her!). . . . Don Euwart is in Natick working for Hybridon, a biotech company, as chemical engineer extraordinaire. Either his tennis game has improved significantly or I'm getting flabby! . . . Herr Doktor Professor (and now Class Prez) Eric Miller is teaching classes he hasn't personally taken at Northeastern University. He is a professor in the Center for Electromagnetics Research. . . . Meryl (Alford) Miller is working in the Boston area for IRI Software as a project leader. She and Eric have purchased a condo in Brookline and expanded their family with a dog named Champ. Maureen is their vet!

Rachel McCarthy is starting her OB/GYN residency in Florida. . . . Stephanie R. Squarcia works in product development for Abbott Labs in San Diego. . . . Charissa Lin (new treasurer), who did a ton of great work for the reunion, is working on a PhD in Course XVI at MIT. . . . Ayisi Makatiani (new VP; you may have known him as Boniface) is starting a company that brings Internet access to Africa. ... Sandy Serkes who has graduated from Harvard Business School was at the reunion with her husband and ex-Chorollaries member, Aaron Goodisman, who is working for Caliper Corp. . . . Eric Brodsky is a resident in internal medicine at UMass Medical Center in Worcester, Mass. . . . Mini Gupta is finished with her first year at Stanford Business School and is also getting a master's in education. She

hopes to work in educational media this summer. Mini sees lots more MIT folks in the San Francisco area than she ever did in Atlanta (go figure!).... Robert Potter works in Silicon Valley and tells us that his brother Kenyon Potter is working for the Golden Gate Authority as a civil engineer.

Bonding (Bing) Yee is a lawyer in D.C. . . . Alissa Fitzgerald, after an eventful trip to Namibia with Beverly Sayler early this June, is bumming around the eastern seaboard with friends and family before she heads to Stanford for a PhD in aero/astro. She worked for three years in Phoenix for Orbital Sciences Corp. Among the folks she's staying with are Ross (call him doctor) Levinsky, '89, who picked up a PhD in mechanical engineering from MIT in '95, and roommate Archon Fung who is getting a PhD in political science at MIT. I crashed this little soiree and saw Penn Loh, who is a research associate at the Pacific Institute for Studies in Development, Environment, and Security in Oakland, Calif. Penn was recently published in the May '95 issue of Z Magazine. . . . Andrzej Skoskiewicz is heading to California after a few years of working in the Boston area. He worked for DEKA and USFIRST and is now involved with Ross on a large commercial automation project. They need a name for their venture. Any suggestions? . . . Hope L. Cooper is pursuing a law

degree from Fordham.

News from some of our classmates who weren't able to attend the reunion: Tonya Parker is happily married and back in Alaska. ... Jean Liu is in a grueling surgery residency at Dartmouth. . . . Chris Rosenwasser is in her last year of med school and we've gotten to hang out in NYC. . . . Helen Shin is in residency in NYC where I randomly ran into her at Denim & Diamonds (a country bar). . . . Yvonne Grierson is still at 3M in Minnesota. ... Beth Kulas is working toward a PhD in economics at Duke. . . . Alex Rosen finished his first year at Stanford B. School. . . . John Carey has finished his first year at Harvard Law School, and is in D.C. for the summer working for an intellectual properties firm. . . . Jose Stevens is finishing a PhD at Stanford aero/astro. . . . Julie Ask is at Michigan Business School. . . . Rob Kosciusko is a fighter pilot instructor in Texas. . . . Marilyn Liang is in her second year of pediatrics residency at University of Rochester. . . . Jenny Snyder is engaged and living in Boston. She works for the National Economics Research Association. ... Laura K. Latham is working at NASA Lewis Research Center on the Advanced Communications Technology Satellite. She is also enjoying her growing family with Kyle, age 1. ... Andrew Knoedler and his wife, Audra, just celebrated their third anniversary! As for me, I am finishing up a stint as a paralegal here in NYC after 2.5 years with GE Aircraft Engines in Lynn, Mass. I'll be heading to Stanford Law this fall. I look forward to hearing from all of you! Until I get my Stanford address, you can send news to me at the following: Max P. Ochoa, secretary, c/o '90 Class Notes, Technology Review, 77 Mass Ave., MIT W59-200, Cambridge, MA 02139; e-mail: <mit1990@ mitvma.mit.edu>

5th Reunion
Please send news for this column to: Andrew Strehle.

secretary, 59 Commonwealth Ave., Apt. 4R, Boston, MA 02116; tel: (617) 450-0637. Or send your e-mail to Renee (Mong) Miller, <miller-rl@post7.laafb.af.mil>

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We are deeply saddened by the news that another classmate of ours passed away last April. Antonio Thomas Pizzigati was killed in a car accident on April 27 in California.

His car struck a tree in a rainstorm. Tony, who was 24, was considered one of the nation's top young talents in computer animation. Tony and some of his friends founded a company called aniMedia, which aimed to make the finest in computer animation tools available to the widest possible computing public. He died just before completing work on the company's first software product, a multiplatform 3D animation system called ani-Meister. Tony, who moved to California a little over a year ago, quickly established himself as a senior consultant in Silicon Valley. "My consulting firm snatched him up as soon as he came to California, because we knew a great find when we saw one," notes Doug Keislar, a partner at Muscle Fish, Inc., the firm that connected Tony to his first Silicon Valley project. "Tony radiated talent." He was born in Ithaca, N.Y., in 1971 but moved in 1975 and grew up in Kensington, Md. He was a basketball enthusiast and enjoyed biking, stunt kite flying, cooking, and playing acoustic guitar. Tony will be sorely missed. He is survived by his brother, Nicholas, a junior at UC/Santa Cruz, and his parents, Sam and Karabelle Pizzigati. An Antonio Pizzigati Scholarship Fund has been created and the family welcomes contributions c/o the University of Maryland, Maryland Educational Foundation, P.O. Box 205, College Park, MD 20741.

Congratulations to Adam Singer and Amy Baumgartel (Wellesley '93) on July 23, 1994. Adam has been working as a management consultant for IBIS Associates, Inc., in Wellesley, Mass. . . . Rodney Register is a software engineer doing object-oriented software development for Bell Northern Research. . . . In May 1993, Susan Margulies writes that she has been working for Hewlett-Packard Medical Products Group in Radiology Ultrasound Imaging Systems since she finished her master's degree in EECS. She spends time working on the Sigma Kappa Advisory Board and playing trumpet. Susan informs us also about some of her friends: Cynthia Holcroft is at Yale Medical School, Rachel Obstler is at Stanford Business School, Lisa Havran is working on a PhD at University of Pennsylvania, and Chris Goh Bardon was married last August. . . . Susan Jackson Quick received an MD degree from Baylor College of Medicine in Houston this past May. She has been accepted into a transitional internship at Travis Air Force Base, David Grant Medical Center in Fairfield, Calif.— Leslie Barnett, secretary, 201 E. 83 St., Apt. 2E, New York, NY 10028

Here's the news for November! Christopher Cotton, after touring 8 European countries in 10 days with Tim O'Malley, '92, moved out to San Jose, Calif., without a job.

After two weeks of job searching, he landed a contract job working at Apple Computer's Apple Online Services (eWorld). He had recently switched jobs, and is now a full-time employee at Apple, writing Internet tools as OpenDoc parts. . . . Kathy Tan finished a master's degree in computer-aided engineering in civil engineering last September, but officially graduated this past May. Since October she has been working at the National Institute of Standards and Technology in Gaithersburg, Md., on interfaces between CAD systems in the computer-integrated construction group. Kathy is also active with her local MIT Alumni/ae group and is heading to Las Vegas for a mini-reunion with people from Conner 2 in Burton-Conner. . . . After two long years of engagement, Katy Evanco and Brian Brown will finally tie the knot on July 8. After their honeymoon trip to Ireland, Katy will wrap up a few loose ends at MIT (like a master's thesis) and then join Brian in their new home in Thornton, Colo. Other MIT people participating in the wedding are Nancy Schondorf, Kevin Mullican, Beth Henderson, '92, Kimball Thurston, '94, and Todd Sachs, '90.

Jorge Calvo had a busy summer. After participating in commencement (June 18) for receiving a master's, Jorge spent the summer

mentoring a group of undergrads in a research opportunity in mathematics, especially topology and knot theory, before taking off to Costa Rica to celebrate his parents' 25th wedding anniversary. This fall he will continue his studies at UCSB's doctoral program in mathematics under a National Science Foundation Graduate Research Fellowship that will pay for school and research (knot theory) for the next three years. . . . Eric Zimmerman and Steve Lustig are in Chicago (in school and working, respectively), Janet Lou is in U of Michigan, Gary Porter is at Harvard Law, and Tom Wu is going back to school at Stanford according to one source. . . . Quyen Chu is in New York working on Wall Street and overall having a great time in the Big City. She recently spoke to Vaale Gafori, who's going to start medical school in New Jersey this fall after finishing a master's in biology at Stanford Graduate School. Quyen Chu regularly sees Lillian Chern, who is at Prudential Securities in the public finance department, and Jane Bae, who is starting her second year of medical school at NYU Med School. Quyen also reports that Peter Cho is starting his second year of law school at NYC and having a good time.

Recently, Aoy Tomita, Carmen Perez de la Cruz, Jane Bae, Matt Lee, '91, and Quyen Chu went down to Atlanta to attend the wedding reception of Ken Chestnut, '92, and Sabah Mirza. They were married in India but had the reception in Atlanta for friends and

family who could not attend the wedding. . . . Bethany J. Foch is still working on a master's in mechanical engineering at MIT. This summer she worked for a composites engineering firm, spent June 21-24 in Gainsville, Ga., for the Elite National crew races, and did a little waitressing on the side. . . . Addela Kamal took her qualifiers this summer; she is in grad school for a PhD in molecular biology. She works in Dr. Richard Anderson's lab there at UT Southwestern in Dallas on receptor-mediated endocytosis-more specifically, the process of clathrin-coated pit budding. . . . Fauzia Butt is at New York Medical College. She likes it a lot there. Tae and Sung (the two cousins who were also Course VII)-Tae is at George Washington University medical school, and Sung is at University of Maryland medical school. . . . Gabriela (Gaby) Canalizo was a physics major and is now in grad school in astronomy at University of Hawaii. . . . Teresa (Ranck) Marshall and her husband, Thomas Marshall, had a baby boy, Thomas Thurgood Marshall, last November. While recuperating from the birth, Teresa helped Yvonne Romero as an alumnae reader of applicant folders. Yvonne is still working for the MIT Admissions Office in room 10-100.

Back in May, Bill Ramsey attended the wedding of Dawn Mitzner, '91, and Paul Laporte, '88, in New York. . . . Stephanie Spenser and Doug Smith, who were married after graduation in '93, have also had their first child. . . .

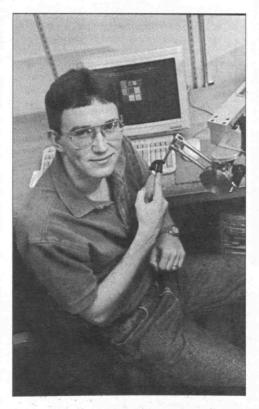
## **ClassNotes**

Robert (Ert) Dredge has been working at the Whitehead Institute/MIT Center for Genome Research since graduating in February '93, doing computational analysis for the genetic map of the mouse, among other things. Ert wais still volunteering at MIT's radio station, WMBR, doing a radio show with Sanjay Vakil, '94, as well as setting up a "kick-butt World Wide Web server for them." At the end of July he moved to Houston to start work on a PhD in computational biology at Baylor College of Medicine. Ert also reports that Julie Hollenback and Craig Zilles, '95, were married on August 19, in Peoria, Ill. There should be lots of alums from '93, so as usual I'm hoping for pictures! Also married this summer were Kerry Forbes and Mark Hanault, '90, on June 17. Leah (Reingold) Gordon and David Benjamin (Ben) Gordon, '94, were married on June 19, 1994, in Urbana, Ill. . . . Stacey Reeves is still hanging out in Oregon and planning to get married next summer. She writes that Catherine Nyarady is still at Cornell Law but is spending the summer in New York interning. . . . Monica Dodds has moved to a new job at P&G and sounds like she's enjoying it. . . . Sherry Ipri is also getting married

## **Tinkering Pays Off, Big Time**

homas Massie, '93, a secondyear graduate student in mechanical engineering, won the first Lemelson Student Prize for inventiveness, valued at \$30,000. The prize, funded by inventor Jerome Lemelson to focus public attention on those who display exceptional creativity, "is the intellectual equivalent of a football scholarship," remarked Lester Thurow, who is the Jerome and Dorothy Lemelson Professor of Management and Economics at MIT and overseer of the award.

Massie started tinkering with mechanical devices as a youngster and was inspired to develop his talents at MIT by watching the 2.70 Design Competition on TV as a ninth grader. He went on to live out his fantasy by winning the contest himself when he was an undergraduate major in electrical engineering. Prolific and wide-ranging in his inventiveness, he assured his place in MIT history by hacking the electronically controlled blackboards in



THOMAS MASSIE, '93

26-100, programming them to move at precisely 1:45 p.m. every day.

Massie's most significant innovation to date, created in collaboration with Kenneth Salisbury, principal research scientist in MIT's Artificial Intelligence Laboratory, is an ingenious "touch interface" for a computer. By inserting fingers into special swiveling thimbles mounted at the end of a small computer-controlled mechanical arm, a person can "feel" and "manipulate" objects on the screen ranging from rubber balls to virtual keyboards. About a year and half ago, Massie formed a company called SensAble Devices to develop and market the device. Potential early applications range from surgical training to computeraided design, and it may also lead to a new generation of video games.

Graduating seniors and graduate students at MIT are all eligible for the Lemelson Prize, which will be awarded annually. ☐ Adapted from a press release from the MIT News Office.

although Stacey Reeves was not sure of the date.-Mari Madsen, secretary, 85 Alberta Rd., Brookline, MA 02167; e-mail: <mari\_madsen@macmailgw.dfci.harvard.edu>

Hello again. Various circumstances conspired to make me miss the last month's column. Sorry. Meanwhile, keep your class news coming!

Our first news comes from Patti Dunlavey who is attending graduate school at the University of Washington in Seattle. Patti writes: "I absolutely LOVE it here! I spent spring break skiing at Whistler/Blackcomb in British Columbia, and I'll be spending the summer in Boston and next quarter in Rome, so life is good. There are a lot of MIT grads in the department here, so I don't ever feel lonely for MIT company. With me are Shanna Kovalchick, '91, Michele Wang, '92, Kim Sykes, '93, Noah Greenberg, and Pedro Hernandez. Kevin Karnes is also out here in the music department."

Patti also notes that has been staying in touch with quite a few Class of '94ers: "Sita Venkataraman is finishing up her second degree at MIT and will be going to Harvard for a master's in landscape architecture in the fall. Shilpa Gadkari is working in New York City for Deloitte and Touche, and is enjoying herself in her nonstudent life. Ginger Hanson is working in Philadelphia; she is really getting into her job and making herself invaluable. Iennifer Sun is in medical school at Dartmouth. Duane Ludwig is having a blast in Japan (Who'd have thought it? From Omaha to Tokyo?), where he'll be working for another eight months or so. Ann Guy is at Berkeley studying for her master's in environmental engineering. Rahul Saha and Tara Shivone are still engaged and both are studying at Georgia Tech. Phil Barker is happily working in Philadelphia. Mike Markmiller is engaged, as well as Jason Ribando."

Meanwhile, back at the 'Tute, Ping-Shun Huang writes: "I decided to go work full time for Silicon Graphics after flying 30,000 miles on various interview trips-unfortunately, every trip took several days away from my master's in engineering thesis, so I should really stop punting now."... Yevgeny Gurevich, writes "I'm finishing a master's in engineering this summer and am moving down to the D.C. area to work for MIL 3. I'm currently rooming with Hugh Morgenbesser, '94, who is also finishing an MNG this summer, and staying in the Boston area to work for BBN." Yevgeny has been in touch with a few '94ers including including Barbara Kennedy and Ted Ko. "Barbara is attending dental school at UPenn. Ted completed an MNG degree this June, is headed for Taiwan for a couple of months, and then going to work on the West Coast."

Mike Feng writes, "I'm in the MS/PhD mechanical engineering program at Cornell and probably have another three or four years in exciting Ithaca, N.Y. I'm in the process of setting up an alumni/ae club there, so if others are interested they can contact me at <mf29@cornell.edu>.'

What's new with you? Setting up an alumni/ae club? Met up with some '94ers? Completed another degree? Send me a brief note.-Jeff Van Dyke, secretary, 6360 N. 31st, Richland, MI 49083; e-mail: <jvandyke@mit.edu>

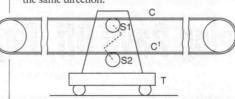
## **Puzzle**

#### Continued from Page MIT 62

dummy with three immaterial hearts and South with the 10, 5, 2 of spades. On the lead of a heart from dummy, South must ruff with the 2 of spades (if East does not ruff the heart); West is free to take his trump but South then has the rest. If South mistakenly ruffs with the 5, West overruffs and leads a club for East to ruff; South can overruff but this promotes another trump trick for West. A pretty trap. However, at trick 9 South can simply cash a high trump, ruff a heart high back to hand, pull the remaining trump and surrender a diamond at the end. Prosaic but

M/J 2. James Abbott likes to play with trains, gear trains that is, and offers us the following challenge.

A traveling carriage T is connected to an endless chain CC<sup>1</sup>, which engages identical sprockets S1 and S2. The sprockets are connected to each other by a gear train whose ratio is defined by the number of revolutions of S2 for one revolution of S1. The sign of this ratio is considered positive when S1 and S2 rotate in the same direction.



By suitably altering the gear train, a variety of motions can be imparted to the carriage.

Letting C refer to the upper run of the chain, determine the gear ratio (magnitude and sign) for the following six conditions:

1. T moves in the same direction as C, at half the speed of C.

2. Same, but at twice the speed of C.

- 3. T moves in a direction opposite to that of C, at half the speed of C
- Same but at twice the speed of C.

5. T remains motionless regardless of the speed of C.

6. T can be moved freely in either direction (by separate forces) but the chain cannot be budged.

The following solution is from Mark Seidel. I solved this one in reverse. Let x be the distance that the upper chain moves to the right, and y be the distance that the cart moves to the right. Then the upper gear moves through a clockwise angle of a1=(x-y)/R, and the lower gear moves through a counterclockwise angle of a2=(x+y)/R. If our gear ratio is r, then we have a2 = -r\*a1. This expression leads to the general relation  $x+y = -r^*x+r^*y$ , which reduces to r = (y+x)/(y-x). The following cases are solved separately.

Case 1. 2y = x ==> r = -3Case 2. y = 2x ==> r = +3Case 3. 2y = -x = -1/3Case 4. y = -2x ==> r = +1/3Case 5. y = 0 = r = -1

Case 6. x = 0 = r = +1

M/J 3. How's your geometry? Gordon Rice asks how many primitive Pythagorean triangles are there whose inscribed circle has diameter 1992. Recall that 6,8,10 is not a primitive Pythagorean triangle since it is simply a multiple of 3,4,5.

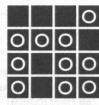
Matthew Fountain writes: There are four. Let the sides of the triangle be X, Y, and Z and note that the triangle can be divided into three triangles by drawing lines from its vertices to the center of the inscribed circle. As the center is 996 units from each side, the area of the original triangle is (1/2) (996) (X+Y+Z). It is also (1/2)XY. Because X, Y and Z are sides of a right triangle we may set X = 2ab,  $Y = a^2 - b^2$ , and  $Z = a^2 + b^2$ . To assure the triangle is primitive we demand a and b to be co-prime with one odd and one even. Equating the two expressions for the area of the original triangle, and substituting for X, Y, and Z yields the equation (1/2) (996)(2ab +  $(2a^2) = (1/2)(2ab)(a^2 - b^2)$  which simplifies to 996 = (b)(a-b). Noting that a-b is odd and 996= (2)(2)(3)(83), b is restricted to 4, 12, 332, and 996. Therefore there are four primitive right triangles circumscribing the circle.

Although not required, the values of a and b are the pairs 253, 4; 95, 12; 335, 332; and 997, 996. The sides X, Y and Z are 2024, 63993, and 64025; 2280, 8881 and 9169; 222440, 2001, and 222449; and 1986024,

1993, 1986025, respectively.

#### Better Late Than Never

Jan 1. Mathew Fountain found the following example which has an odd number of circles in all 4 rows, all 4 columns, and all 8 diagonals. To boot, he points out that all knight-move paths



contain either one or three circles.

Jan 2. Bill Bruno notes that the published solution shows sixteen players not fourteen. Indeed, this is correct. The proposer has a solution with 4 second pairing, which is believed to be minimal. This solution is available from the editors of Technology Review upon request.

M/J SD. Perhaps we should have reminded readers that on computers x + y will give x even when y is not zero. One just needs y to be MUCH smaller than x. It takes a while but 1/i does becomes sufficiently small.

#### Other Responders

Responses have also been received from G. Blondin, M. Buote, R. deMarrais, S. Feld, J. Grossman, W. Hartford, R. Hess, P. Kramer, J. Landau, G. Leibowitz, M. Lindenberg, S. Maley, A. Ornstein, G. Perry, D. Peterson, F. Powsner, K. Rosato, E. Sard, L. Schaider, R. Sinclair, D. VanPatter, and A. Wasserman.

#### Proposer's Solution to Speed Problem

Don't bid. Since P is less than B, the expected value of the box is less than B/2 and your expected return is only  $1.5 \times B/2 = .75B$ .

# CourseNews

### CIVIL AND ENVIRONMENTAL

Michael S. Schultz, SM '81, was promoted to VP of Camp Dresser & McKee, Inc. (CDM), the international environmental consulting engineering firm. Schultz has 18 years of experience in geotechnical engineering, hazardous-



Michael Schultz

waste-site management, and environmental compliance for industry, with emphasis on the application of geotechnical engineering to the assessment, analysis, design, and construction of environmental projects. Schultz currently manages remediation projects undertaken at a multiple-site, long-term

cleanup and restoration program for a major manufacturer in New York. The site consists of 14 hazardous waste disposal areas slated for groundwater. Schultz is also serving as project director of a multiple-site remedial design program at a neighboring auto manufacturing facility. . . . Sue C. Finkelstein, SM '64, writes: "I am working at the New York City Department of City Planning." . . . Stan Brown, SM '65, reports: "After 25 years as a college professor, I decided to join the real world. I now work for the Division of Mechanics and Material Science in the FDA's Center for Devices and Radiological Health." . . . Jack Kinstlinger, SM '54, reports: "I am CEO and chairman of KCI Technologies, an engineering company headquartered in Maryland with a dozen offices throughout the eastern United States. We work for public agencies and corporations in the fields of transportation, environment, building design, and construction management. Previously, I had been the highway director for the state of Colorado and deputy secretary of transportation for Pennsylvania. Immediately after graduating from MIT, I served in the Civil Engineers Corps of the U.S. Navy and then learned the trade with an international consulting engineering firm whose New England branch office in Fall River, Mass., I headed. I am married to Marilyn and we have two sons, Michael and Jeremy." . . . Guy Dufresne, SM '65, a 1964 graduate of École Polytechnique, received the École Polytechnique Alumni Merit Award for 1995.... Shi-Chang Wooh of the MIT Department of Civil and Environmental Engineering was named the Esther and Harold E. Edgerton Assistant Professor. Professor Wooh, who has been at the Institute since October 1994, holds a BS degree in mechanical engineering from Yonsei University in Seoul, Korea, an MS in mechanical and aerospace engineering from Illinois Institute of Technology, and a PhD in theoretical and applied mechanics from Northwestern University. From 1992 to 94, he was a research scientist/assistant professor at Northwestern, where his research

and teaching involved nondestructive evaluation and mechanics of composite materials including thick polymer composites, ceramic matrix composites, and metal matrix composites. He is currently teaching Design of Steel Structures and will teach Nondestructive Evaluation of Materials and Structures.

Alumnilae may send information for Course News to <mitalum@mitvmc.mit.edu>.

## MECHANICAL ENGINEERING

Frederick H. Silver, SM '75, PhD '77, writes: "I am a professor of pathology at the Robert Wood Johnson Medical School in Piscataway, N.J., a member of the faculty of

Volectria Corp., the Massachusettsbased electric vehicle maker founded by James Worden, '89 (II), and Anita Rajan, '90 (VI) (who recently married in Christian and Hindu ceremonies), unveiled the nation's first electric car made from scratch and designed for mass production. The sleek four-seater known as the Sunrise is expected to sell for less than \$20,000 and travel 120 miles per charge (using lead-acid batteries). With a body made of lightweight composite materials, the Sunrise weighs only 1,600 poundsless than any car now being sold by the major automakers on the U.S. car market.





D	EC	RE	E	C	0	D	E

Aeronautical Engineer

BE **Building Engineer** CE Civil Engineer

CHE Chemical Engineer

Computer Science Engineer CSF

DPH Doctor of Public Health

EAA Aeronautical & Astronautical Engineer

EF Electrical Engineer

EGD Doctor of Engineering

ENE **Environmental Engineer** 

Master in Architecture Advanced Studies MAA

Materials Engineer MAE

Master in Architecture MAR MCP Master in City Planning

Mechanical Engineer ME Meteorologist

Mineral Engineer MIE

MME Marine Mechanical Engineer MPH Master in Public Health MTF

Metallurgical Engineer NA Naval Architect

NE Naval Engineer NUE Nuclear Engineer

OCE Ocean Engineer PhD Doctor in Philosophy

ScD Doctor of Science SE Sanitary Engineer

Master in Engineering SM MNG Master of Science

PHOTO: R.V. RAJAN TECHNOLOGY REVIEW MIT 51

### GAZETTE

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Biomedical Engineering Graduate Program at Rutgers University, and president of Medical Device Development Co. in Bangor, Pa., a company that assists in device development and manufacturing. . . . Anne M. Mayes, '86, of the MIT Department of Materials Science and Engineering, has been selected to hold the Class of 1948 Career Development Professorship. Mayes joined the MIT faculty in January 1993 after two years as a visiting scientist at the IBM Almaden Research Center in San Jose, Calif. She holds a PhD in materials science and engineering from Northwestern University. Her research group of four graduate students, one undergraduate, and a postdoctoral fellow is involved in theoretical and experimental investigations of polymer systems, with a special focus on block copolymers and surface and interface modification. Myers is a recipient of an NSF Young

Investigator Award.

Kevin N. Otto also of the Department of Mechanical Engineering has been named to the Robert N. Noyce Career Development Professorship. Otto, who holds a BS degree in mechanical engineering from the University of Minnesota and a PhD in engineering and applied science from the California Institute of Technology, joined MIT in 1992. His research and teaching are focused on developing and using engineering- and manufacturing-based structured methods for product development. He is active in the Leaders for Manufacturing research program. . . . The Association of Alumni and Alumnae was notified that Charles Jephthiah Jeffus, SM 39, of Greensboro, N.C., died on August 28, 1994. No further details were provided.

Alumnilae may send information for Course News to <mitalum@mitvmc.mit.edu>.

### MATERIALS SCIENCE AND ENGINEERING

Peter Farnsworth Grasty, SM '91, died on April 5, 1995, at the California Pacific Medical Center in San Francisco, Calif., following a brief illness. He graduated from San Jose State University in 1989 and was the first engineering graduate of San Jose State to earn an advanced degree at MIT. In 1993, Grasty moved from Boston to the Bay Area to attend a PhD program at UC/Berkeley. He had recently embarked on a new career as a change management consultant at Anderson Consultants in San Francisco.

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## ARCHITECTURE

Lawrence J. Vale, SM '88, the Mitsui Career Development Assistant Professor of Urban Studies and Planning at MIT, was one of three MIT faculty members among the 152 artists, scholars, and scientists who received 1995 Guggenheim Fellowships. He will continue his work on the death and life of American public

William Vogt Kaeser, SM '32, of Madison, Wis., died on April 13, 1995, in Tucson, Ariz., where he spent winters. Kaeser operated his

own practice in Madison continuously since 1935, with military service the only interruption. He was featured in various national magazines for his passive solar homes and was honored by the Wisconsin chapter of the American Institute of Architects. His firm also included Art McLeod and Marcus Weston, both followers of Frank Lloyd Wright. The Madison Art Center featured "William V. Kaeser: Madison's Organic Architect" curated by Anne Biebel, whose master's thesis was "Residential Architecture of William V. Kaeser." All of Kaeser's work can be found in the archives of the State of Wisconsin Historical Society.

The Association of Alumni and Alumnae was notified that Martin Richard Friedmann, SM '93, of Chicago, Ill., died on February 2, 1995. No further details were

Alumni/ae may send information for Course News to <mitalum@mitvmc.mit.edu>.



David Bailey

David Bailey, PhD '68, professor of chemistry and director of the Natural Science Division at Illinois Wesleyan University, is one of four professors there to receive a \$140,000, threeyear National Science Foundation Grant for the development of a new undergraduate chemistry curricu-

lum. The grant calls for the faculty to write new chemistry textbooks, merging general and organic chemistry concepts typically segregated in the first two years of college chemistry.

John Rogers, a Course V graduate student, received an honorable mention in the fifth annual BF Goodrich Collegiate Inventors Program. His work took a measurement method previously confined to the research laboratory and reduced it to a practical device suitable for routine materials testing and online process monitoring. Rogers developed a new method for nondestructive testing of thin film mechanical, thermal diffusion, and adhesion properties, and he also found a way to reduce the 12by-4-foot measurement apparatus to the size of a briefcase, thus also reducing its cost and complexity of operation. His invention could have widespread applications in the microelectronics, automotive, plastics, paint, and protective coatings industries.

The Association of Alumni and Alumnae was notified that Bertha S. Wiener Dodge, SM '22, of Burlington, Vt., died March 5, 1995, and Russell Austin Cowles, SM '25, of Birmingham, Mich., died November 21, 1994. He had worked for Difco Laboratories from 1925 until his retirement as technical director in 1974. He was 94 years old.

Alumni/ae may send information for Course News to <mitalum@mitvmc.mit.edu>.

## ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

David R. Karger, assistant professor of electrical engineering and computer science at MIT, has won the doctoral dissertation award of the Association of Computing Machinery. The award, presented in March, was for "Random Sampling in Graph Optimization Problems," done at Stanford University. . . . Felice Frankel, a visiting lecturer in electrical engineering and computer science and artist-in-residence at MIT, was one of three MIT faculty members among the 152 artists, scholars, and scientists who received 1995 Guggenheim Fellowships. Frankel will conduct a photographic exploration of the science of surfaces.

The Association of Alumni and Alumnae was notified that Norman Noel Alperin, SM '56, of Rancho Palos Verdes, Calif., died on May 26, 1994. No further information was

provided.

Alumnilae may send information for Course News to <mitalum@mitvmc.mit.edu>.

#### VI-A INTERNSHIP PROGRAM

I delayed writing this column until after Technology Day in order to further report on its special World War II remembrances and the alums I'd met. The Institute mounted an excellent exhibit in the Compton Gallery (across from the Alumni/ae Office, 10-110) of MIT's major research activities connected with WWII. Doc Edgerton's work with high-intensity illumination for night photography was displayed with photos, models, and videotape; the famous Radiation Laboratory that worked with the British to develop radar; Doc Draper's Instrumentation Laboratory (now Draper Lab) with its gyro bomb-sight development; the Servomechanism Laboratory under Gordon S. Brown, '31, SM '34, ScD '38, who later served as head of the Department of Electrical Engineering; and much more. It is a wonderfully organized exhibit-and especially interested me as a WWII participant and my later association with many of those whose work is depicted. The exhibit may still be up when you read this.

Of special interest to me were the VI-A alumni/ae I met this Technology Day. In the crowd west of Kresge, waiting for the special fly-by of WWII planes honoring MIT alumni/ae who lost their lives in that horrendous war, I met: James M. Mikkelson, '70, SM '72, EE '72, who is VP for technical development at Vitesse Semiconductor Corp. and whose daughter, Joanne, is now a senior in VI-A (gives you an idea of how long I've been around!); Kenneth T. Pogran, '70, SM '72, EE '72, a senior scientist with BB&N in Cambridge; Steven H. Blumenthal, '75, SM '77, a project manager with BB&N; and William E. Northfield, '57, SM '57, the president of Celltell in Arlington, Mass. (He was the president of our Eta Kappa Nu chapter when I first became faculty advisor in February 1956!)

By chance, at lunch on Technology Day, I met Melvin M. Weiner, '55, SM '56, with whom I had worked as an officer of the former Boston Alumni Chapter of Eta Kappa Nu. He told me that his brother, Donald D. Weiner, '56, SM '58, EE '60, became the head of the Department of Electrical Engineering at

Syracuse University.

My Technology Day afternoon visitors included Reverend Charles J. Hooker, '45, from whom I learned of his acquaintance with Professor Karl L. Wildes, SM '22 (XVIII), who had assisted Professor William Timbie in running VI-A and who had encouraged Hooker to go into the ministry.

Late in the afternoon, I had a phone call from Philip H. Byer, '70, SM '72, PhD '75, a professor of civil & environmental studies at the University of Toronto, who recalled our association in running the first departmental Stu-Fac Steak Frys and whom I had counseled

in switching from Course VI to I.

I invited VI-A's present director, Professor Markus Zahn, '67, SM '68, EE '69, ScD '70, to give me current news of the program. He tells me that all VI-A students are out on their summer assignments and he expects most will find challenging work that enhances their classroom experiences. Those just completing their junior year were informed by mid-June of their admission to the fifth year for participation in the Master of Engineering program.

Zahn continues: "At the start of my VI-A directorship in the summer of 1994, I visited many VI-A companies close to MIT. At the conclusion of my first year as VI-A director, I wanted to get further personal exposure to the work environments and people that the VI-A students see. During this summer, I plan on

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visiting many of the Southwest and West Coast VI-A companies. The prime focus of my visits is to encourage those companies that currently do not offer any financial support during the VI-A Graduate Work Assignment to join the VI-A Fellowship Program."

The month of May brings annual honors and awards, both departmental and Institute, and our VI-A students continue to be winners. At the May Departmental Social & Awards Ceremony, held this year in the West Wing of Boston's Museum of Science, the following were awarded: Northern Telecom/BNR Project Awards to Joel L. Dawson and Trey E. Ideker; George C. Newton Undergraduate Laboratory Prizes to Adam R. Holt and John L. Wallberg; William A. Martin Memorial Prize to Matthew W. Eldridge; and an Ernst A. Guillemin Thesis Award to Jonathan M. Walton. In last November's competition, Benjamin Van Roy, '93, was one of five winners in the EECS Master Works Oral Presentations.

At the Institute Awards Convocation, Agnieszka Reiss was one of the winners of a Malcolm G. Kispert Award as a Senior Scholar-Athlete of the year. Boris Pevzner won first place in the Institute's S. Klein Prize Competi-

### **IEEE Honors Jacobs**

rwin Mark Jacobs, SM '57, ScD '59, chairman and chief executive officer of QUALCOMM, Inc., San Diego, Calif., was honored by

the Institute of Electrical and Electronics Engineers with its Alexander Graham Bell Medal for his outstanding contributions and leadership in telecommunications. The award is sponsored by AT&T Bell Laboratories. Jacobs holds eight patents for innovations in wireless digital communications through QUALCOMM, a company he estab-

lished in 1985. His prior company, Linkabit, is considered the wellspring of San Diego's successful telecommunications industry. The recipient of numerous awards, Jacobs was granted the National Medal of Technology in 1994, one of the highest awards bestowed by the President of the United States. It recognizes extraordinary achievements in the commercialization of technology, or the development of human resources that foster techno-

logy commercialization. He also received the San Diego Entrepreneur of the Year award in 1991 for high-technology achievement; the American Electronics Association Inventing America's Future award in 1993; and the Cornell University Entrepreneur of the Year award in 1994. He was the joint

recipient of the American Institute of Aeronautics and Astronautics biannual award for outstanding contribution to aerospace communications in 1980. Jacobs is an IEEE Fellow and a member of the National Academy of Engineering. He earned a BEE from Cornell in 1956.



## MICHAEL JACOBSON AND THE FOOD POLICE

BY VINCENT KIERNAN

wants you to eat a better diet, and he's willing to make a stink if it might convince you and other Americans to heed his message. Jacobson heads the Center for Science in the Public Interest, a Washington-based nonprofit group convinced

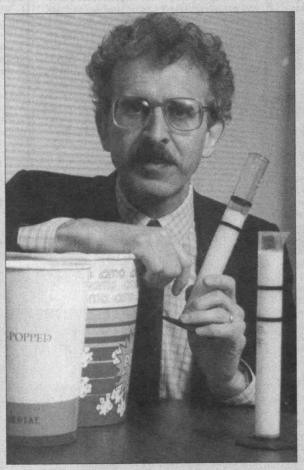
that the national menu is far too high in fat and sodium. Dubbed the "food police" by the mass media, Jacobson and his colleagues make their point by periodically testing various favorite American foods and then holding dramatic press conferences to issue their dietary indictments. Chinese, Mexican, and Italian food, among others, have all been in CSPI's gunsights.

At their press conferences, CSPI staffers hand out detailed laboratory analyses of food bought anonymously from restaurants around the country. But they go beyond dry data, dishing out flashy quotes and sharp visual images designed to grab headlines in the daily newspapers and air time on network news broadcasts: For example, Jacobson regularly poses with test tubes filled with fat to dramatize the fat content of a given menu item, and he never cringes from hyperbole—like the CSPI press release describing butterand-cream-rich fettucine Alfredo as "a heart attack on a plate."

Such rhetoric angers restaurant owners. "Michael Jacobson is an honest man," says Jeff Prince, senior director of the National Restaurant Association. "He's just wrong." Prince says the CSPI studies have serious flaws, such as overestimating the serving sizes of Chinese food and ignoring low-fat Mexican items such as soft-shell tacos. Moreover, he says, the CSPI studies ignore the fact that

most people eat a small proportion of their meals in restaurants, so the health impact of those meals is small.

But others think that Jacobson is a godsend who has improved the public's health. "He is one of the classical American folk heroes," says Dr. William Castelli, the recently retired-



Michael Jacobson demonstrated the fat content of movie-theater popcorn with test tubes filled with fat.

director of the Framingham Heart Study, which has tracked the cardiovascular health of 5,100 residents of Framingham, Mass., since the 1950s.

Castelli credits Jacobson and CSPI with confronting Americans with the uncomfortable fact that much of what they eat isn't good for them.

"People need to have their bells rung," Castelli says. "Otherwise, they're going to go on blithely doing what they're doing, until they get their heart attack."

But constantly scaring people may not be the answer, says Barbara Schneeman, a nutritionist and dean of

the College of Agricultural and Environmental Sciences at the University of California/Davis. Being told repeatedly that various types of food are unhealthy "builds a sense of frustratrion among comsumers" she believes. In that frustration, people may start ignoring all nutritional advice.

Jacobson got into food sleuthing by accident. He was working on a doctorate in microbiology at UC/San Diego, in the late 1960s when his advisor, David Baltimore, '61, moved to MIT. Jacobson followed Baltimore to the Institute to finish his degree, and he found the campus to be a hotbed of sentiment against the Vietnam War. In that climate, laboratory research did not seem quite so compelling: "I wanted to use my scientific background to influence public policy more directly than doing research," he recalls.

After earning his degree in 1969, Jacobson decided to work a six-month stint at

Ralph Nader's Center for the Study of Responsive Law in Washington. Nader asked him to write a book on food additives. "I said, 'Sure. What's a food additive?' " Jacobson learned quickly, wrote the book, and his career in public nutrition was off and running.

Jacobson and two other scientists started CSPI on a shoestring in 1971. Their goal at the time was to encourage scientists to apply their skills to a wide range of public-interest issues. By that yardstick, CSPI might be seen as a failure: "We never figured out how to do that effectively," Jacobson says wistfully. In 1977, Jacobson's two cofounders left, and the group that remained focused sharply on issues of nutrition and food safety. Today, the center has a staff of more than 50 and an annual budget topping \$11 million, which comes from foundation grants, subscriptions and publication sales,

The most visible coup by Jacobson and company was the movie industry's response to a 1994 CSPI study showing even a small serving of movietheater popcorn to be laden with more saturated fat than government standards recommend eating in an entire day. Headlines screamed danger, and within weeks national theater chains announced they would switch from corn popped in saturated coconut oil and drizzled with butter to a variety of healthier alternatives—air-popped corn, for example.

and donations.

Whether other CSPI studies are having any impact is difficult to measure. Some restaurants now highlight lowfat, low-sodium options on their menus, and two national Mexican fast-food chains have rolled out lighter products in the wake of CSPI indictments, Jacobson says. But Prince notes that in the months after the center released critical and highly publicized studies of the offerings at Italian and Mexican restaurants across the country, patronage actually rose.

Even a CSPI-sponsored national survey suggests that many people ignore the center's studies. In an October 1994 telephone poll of 993 U.S. adults, about half the people said they had heard of the CSPI findings. Of these, 81 percent said that the studies are "a valuable service to the public." Half of those who learned of this new information—43 percent—had changed their restaurant eating habits as a result. That suggests that Jacob-

son and his colleagues have influenced the behavior of some 20 percent of the target population, a non-trivial achievement that they also demonstrated

this year in a closely monitored collaboration with researchers at West

Virginia University (WVU).

The CSPI-WVU team set out to lure residents of Clarksburg, W. Va., to switch from high-fat milk, such as whole milk and 2 percent milk, to lower-fat varieties such as skim and 1 percent. Nutritionists often suggest such a switch as an easy way for most people to cut gobs of fat from their diets. The experiment included advertising on local television and radio, staging taste tests at supermarkets, and arranging for speeches promoting a low-fat diet to be given at local factories. Sales of high-fat milk dropped by 20 percent, and sales of low-fat milk rose by a comparable amount, Jacobson says."It was probably the most effective community education effort ever," he says.

In the past, the center has also lobbied the federal government, with some success, on consumer-related nutrition issues, such as pushing for improved labelling of fat content in foods. But the new political landscape in Washington—where anti-regulation Republicans control the Congress—may have killed the prospects for further action in that vein, Jacobson says. Federal bureaucrats probably will refuse to risk antagonizing Congress by issuing new pro-consumer regulations, he believes.

So CSPI will continue to focus on what it does best: studying what we eat and making sure that we can't claim we had no idea which foods are unhealthy and which ones are not.

VINCENT KIERNAN is a freelance writer and an editor for New Scientist magazine in Washington.



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tion for Scientific and Technical Writing.

In the scholastic honor societies VI-A students continued to do well: 22 were elected to Tau Beta Pi; 27 to Eta Kappa Nu; 7 of the 45 seniors elected to Phi Beta Kappa were from VI-A; 3 of the 75 seniors elected associate members of Sigma Xi were from VI-A.

Arts and athletics play an important role in the lives of MIT students. The following VI-A students were recognized for high achievement: Joel L. Dawson received a Ragner & Margaret Naess Award in recognition of his high level of private music performance study and Straight-T Athletic Awards went to Katherine Merrilees and John L. Wallberg.

Mrs. A. Lucy Allen, whom many of you will remember worked in the VI-A Office and became a friend to many VI-A students, was fêted at a retirement party on June 7th. We wish her well in the years to come!—John A. Tucker, director (emeritus) and lecturer, VI-A Program, MIT, 77 Mass. Ave., Rm 38-473, Cambridge, MA 02139-4307; e-mail: <jat@fenchurch.mit.edu>.

## BIOLOGY

MIT Professor David Baltimore, '61, is one of three MIT professors recently named Institute Professor, a title that MIT reserves for about 12 scholars of special distinction. The honor is initiated by the faculty and bestowed jointly by the administration and faculty. In addition to the prestige associated with the title, an Institute Professor has a distinctive measure of freedom to define the scope and nature of his or her responsibilities. Reporting directly to the provost rather than to a department head or school dean, the Institute Professor does not have regular departmental or school responsibilities. Baltimore has been on the MIT faculty since 1968 except for 1990 to 1994, when he served as president and then professor at Rockefeller University. He was director of the Whitehead Institute for Biomedical Research from 1982 to 1990. In summarizing the assessments of Baltimore's peers, Professor Robert Jaffe, chair of the faculty, said: "David Baltimore has been a leader in nearly every facet of modern biology. He has done significant research on DNA replication, the biochemical mechanisms of oncogene action, and the molecular mechanisms that regulate immune response. The discovery of reverse transcriptase enzyme, for which Baltimore-at the age of 37—and Howard Temin received the Nobel Prize in 1975, helped form the basis for modern genetic engineering. Baltimore's work includes more than 500 scientific papers and articles. In his laboratory, he has trained hundreds of students and colleagues who have become leaders in biological science. He was a strong force behind the development of the MIT Center for Cancer Research founded by the late Professor Salvador Luria. He was the driving force, with philanthropist Jack Whitehead, in creating and leading the Whitehead Institute, affiliating it with MIT and greatly strengthening the Department of Biology, making it a premiere center for



In June, Yvan Allaire, PhD '73 (right), received a Doctorate Honoris Causa from the Bucharest Academy of Economic Studies in Romania for his work in strategic management and his contributions to that country's economic development. Earlier this year, he was named the new chair of the Management of Transnational Enterprises program at the University of Quebec at Montreal. The position is funded by the Bombardier Foundation.

the training of graduate students and postdoctoral fellows. As a public participant on scientific issues, he was a leading voice urging a temporary moratorium on recombinant DNA research in the 1970s until the possible hazards were addressed. His work as co-chair in 1986 of the Committee on a National Strategy for AIDS, in assessing the risks and needs to meet the AIDS disaster, is an example of his deep societal concerns and commitment."

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## PHYSICS

Jacqueline N. Hewitt, PhD '86, of the MIT Department of Physics, a radio astronomer who has made significant contributions in the study of gravitational lenses, has been chosen by her faculty colleagues to receive the 1995-96 Harold E. Edgerton Award. The award, which recognizes young faculty members for distinction in teaching, research, and service to MIT and carries an honorarium of \$5,000, was established in 1982 with contributions made by the faculty in honor of Institute Professor Harold E. Edgerton, who died in 1990. The award citation said Hewitt "has made significant contributions in the study of gravitational lenses-the bending of light by matter predicted by general relativity." In addition to discovering the first Einstein ring, she "also discovered one of only a handful of gravitational lenses known as 'quads,' which consist of four split images of a distant radio source. The time differences between the temporal variations of various components of a gravitationally lensed object can lead to determination of the Hubble constant. In this regard, Jackie was the prime mover of the

research that led to the first radio measurement of the time delay in a gravitational lens. Overall, Jackie's group is arguably the best in the world at discovering, investigating, and probing the physical properties of these sources." Her current projects include searching for planets around low-mass stars using phased verylong-baseline interferometry and developing a prototype of an array of very small radio telescopes, each with wide fields of view, to monitor transient radio sources. The citation praised Hewitt's teaching, particularly in Introduction to Astrophysics, and said she consistently receives high ratings from students.



Roman Jackiw

Roman W. Jackiw, MIT professor of physics, is the 1995 winner of the Dannie Heineman Prize for Mathematical Physics. He was cited "for his imaginative use of quantum field theory to throw light on physical problems, including his work on topological solutions, field theory at high temperatures, the existence

of anomalies and the role of these anomalies in particle physics." The prize was established to encourage further research in the field of mathematical physics. Since 1959 it has been administered by the American Physical Society and the American Institute of Physics. . . . Patrick A. Lee, PhD '70, the William and Emma Rogers Professor of Physics at MIT, received a 1995 Guggenheim Fellowship. He plans to work on a theory of high-temperature superconductors.

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### CHEMICAL ENGINEERING

Margaret Ingalls, SM '83, from Orange, Calif., writes: "I have two boys (7 1/2 and 5) and have been doing part-time consulting for the last two years. Since Universal Oil Products bought Unocal's technology licensing division, my husband was transferred to Chicago." . . . Jackie Y. Ying, the Thomas D. and Virginia W. Cabot Career Development Assistant Professor of Chemical Engineering at MIT, recently received an Office of Naval Research Young Investigator Award for showing exceptional promise for doing creative research and teaching. She is one of 33 investigators selected for the awards from more than 400 applicants this year. Her award includes a base grant, special equipment, and matching funds for up to \$500,000 towards research in nanostructured materials. The grant will particularly enhance her research activities in nitride-based nanocomposite processing and surface chemistry.

Daniel Wang, '59, SM '61 (XX), the Chevron Professor of Chemical Engineering, is one of three MIT professors recently named Institute Professor, a title that MIT reserves for about 12 scholars of special distinction. The honor is initiated by the faculty and bestowed jointly by the administration and faculty. In addition to the prestige associated with the title, an Institute Professor has a distinctive measure of freedom to define the scope and nature of his or her responsibilities. Reporting directly to the provost rather than to a department head or school dean, the Institute Professor does not have regular departmental or school responsibilities. In announcing Wang's appointment, Professor Robert Jaffe, chair of the faculty, said: "Danny Wang has been the driving force in biochemical engineering at MIT and throughout the world. Many of his students have been the leaders in this field, which, as his colleagues noted, has been one of the underpinnings of the nation's biotechnology industry." Professor Jaffe said one group that nominated Wang summarized his contributions this way: "Dan Wang's research contributions span an extremely broad range of biochemical engineering applications. These include fermentation, monitoring and control of bioprocesses, renewable resource utilization, enzyme technology, product recovery and purification, protein aggregation and refolding, and mammalian cell cultures . . . He has supervised approximately 50 doctoral students who are now leaders in industry positions and academia. In addition, Dan has contributed to the nation in terms of service to engineering and biotechnology. For example, he has been the chair of the Membership Committee of the National Academy of Engineering, a member of the National Biotechnology Policy Board at the National Institute of Health, a member of the National Research Council Committee on Bioprocess Engineering, a member of the National Research Council Committee on Biotechnology, and a member of the Board of Biology of the National Research Council." Jaffe noted that the Biotechnology Process Engineering Center, established and directed by Professor

Wang and now entering its 11th year, has

trained hundreds of scientists-among them scientists at nearly every top academic institution in the country, as well as many leading biotechnology companies-and has been a magnet for the Undergraduate Research Opportunity Program (UROP) at MIT. Some 700 students have participated in this program to date. His summer course on Fermentation Technology is the longest running (30 years) and most successful course at MIT, having educated more than 2,000 people from industry. Wang, who received a PhD in chemical engineering from the University of Pennsylvania in 1963, joined the MIT faculty in 1965. He is a member of the National Academy of Engineering and the American Academy of Arts and Sciences. He has cowritten five books and more than 100 papers for professional journals.

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#### X-A PRACTICE SCHOOL

We're hardly used to the joys of spring, yet it's time to write for a publication scheduled for the fall! Since this report was written during the week after commencement, we can report on only one of the two major end-of-the-year events at MIT; for Technology Day and reunion news look for the November/December issue.

Among SCEP graduates who received doctorates on June 9: Paschalis Alexandridis, SM '90, PhD '94, accompanied by his wife, Marina, and daughter, Nataly, came from Sweden for the big day. He is midway through a post-doctoral appointment at the University of Lund.

Timothy Dalton, SM '90, PhD '94, came from nearby Hudson, Mass., to be honored for the doctorate he received late last year. He works at Digital Equipment Corp. . . . For Alexandros Koulouris, SM '91, collecting her doctorate was no trip at all; she holds a post-doc appointment at MIT. . . . To receive a PhD, Kai-Chee Loh, SM '91, came from Singapore, where he has a teaching appointment in the fall.

Carlos Rojas-Guzman, SM '91, made a round trip from Mexico City, where he works with McKinsey and Co., to collect a PhD and to see his brother Javier receive an MIT master's degree in civil & environmental engineering. . . Another long-distance traveler was Hiroshi Saito, SM '91, who came from Japan, where he holds a post-doc appointment at Tsukuba Science City.

Colin Wolden, SM '92, left his students at SCEP's Natick Station for the day to collect a PhD. Last summer, he was served as director of the station at the Army's Natick Laboratories.

In addition, 22 degrees of master of science in chemical engineering practice were awarded at the commencement exercises. Most of these students will go on to doctorates, many of them at MIT. Two for whom the SMCEP is a terminal degree (at least for now) announced their post-graduation plans: Markus Langner, SM '95, is a management consultant with the Monitor Co. in Cambridge, Mass., and Ana Laplaza, '94, SM '95, is a process engineer with Exxon in Houston.

As the 1994–95 academic year ended, Christopher Dowd, Jr., SM '93, who is studying for an MIT doctorate, was honored with a special service award for contributions to the department's student government.

Cherry L. Emerson, SM '41, writes that, after a number of generous contributions to his undergraduate alma mater, Emory University, his academic philanthropy is now focused on the arts at MIT. He was awarded an honorary doctor of science a year ago by Emory, where he has endowed a chair in chemistry and a supercomputing center. . . . From Emerson's classmate, Charles Hunter, SM '41, in Wilmington, Del.: "After 37 years of service, I retired from the DuPont Co. in 1978. My wife, Marion Todd, whom I met while in Practice School, and I celebrated our 50th wedding anniversary in 1992. We have two daughters and three grandchildren. Two years ago, I had a hip replaced. Marion and I enjoy travel and have visited all the continents except Australia."

At the editor's suggestion, Joseph Polack, SM '43, ScD '48, now in Baton Rouge, summarized his 47 years since leaving the Institute: "After MIT I spent 22 years with Esso (now Exxon)—all in Baton Rouge except for two years in Houston. I retired in 1970 as director of the Esso Research Laboratories, Esso's principal petroleum process development lab. Then, I joined Louisiana State University for a 6-year tour as professor and head of the Chemical Engineering Department. That was followed by 11 years as director of LSU's Audubon Sugar Institute. I re-retired in 1987 but have continued as a consultant to a nearby cane sugar factory. In 1991, I started a small enterprise that I call 'Top Management.' There are eight 'clients,' all owners/CEOs of different small businesses, who meet together once a month to advise each other on matters of mutual interestsuccessful and rewarding activity. These activities still leave time for golf and travel. Anne and I have fortunately had some grand trips. In recent years, I corresponded with Art Power, '42, and Miguel "Mike" Unson, SM '42, but am otherwise out of touch with friends from the MIT days, and would enjoy hearing from any of them."

Gordon Burck, SM '75, in Alexandria, Va., also replied to a request for news from the editor with the following: "I am a senior policy analyst at EAI Corp. and am mostly engaged in supporting preparations by the Arms Control and Disarmament Agency and the Department of Commerce to implement the Chemical Weapons Convention. Last year, I wrote a draft instruction manual and designed forms for the industry declarations, and in the spring of 1995 we presented, for the third year, a series of seminars for industry to describe reporting and inspection requirements in the treaty. We're also interested in helping companies in chemical and related industries who may need help to understand and fulfill the new requirements."

From Knoxville, Steven De Cicco, SM '77, reports that he has a new job as the director of engineering for Thermatrix, Inc., which is commercializing a flameless oxidizer for VOC control. Previously, he spent 10 years as the manager of process design at International Technology Corp. in Knoxville.

Walter Ullrich, SM '28, ScD '36, of Pleasantville, N.Y., a retired physician, died in New Orleans on March 25. Ullrich was a graduate of Course X-B, the Practice School's undergraduate program that ran from 1921 into the 1930s.

Send news to the undersigned by mail or fax (617) 258-8778 at *Technology Review* or by e-mail in care of <a href="mailto:sprepo@mit.edu">sprepo@mit.edu</a>; or to Car-

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ol Phillips at the SCEP office, Room 66-309, (6l7) 253-6600, <carol@pracschool.mit.edu>.— John Mattill, Room W59-200, MIT, Cambridge, MA 02l39.

### URBAN STUDIES AND PLANNING

James O. Cannon, MCP '72, writes: "I am CEO of HealthInsight, which monitors and promotes health care quality in Utah and Nevada. I am active nationally in health care improvement-related policy and program development." . . . James M. Symons, SM '55, ScD '57, the Cullen Distinguished Professor of Civil Engineering at the University of Houston, has a new book entitled Drinking Water: Refreshing Answers to All Your Questions (Texas A&M University, 1995). Symons wrote the book with the hope of educating consumers who have been showered with a confusing array of claims and statistics by watchdog groups, companies that sell bottled water, and books and articles that sound the alarm about drinking water. His book is divided into chapters on health aspects, aesthetics, home facts, conservation ideas, water sources, suppliers, distribution, regulations and testing, and a final section on fantastic facts, with such questions as why do they call fire hydrants fire plugs? In the 1970s, Symons was head of the U.S. EPA research team investigating the discovery that chlorine used as disinfectant could react with naturally occurring substances in the water to form carcinogenic trihalomethanes.

Alumnilae may send information for Course News to <mitalum@mitymc.mit.edu>.

## EARTH, ATMOSPHERIC AND PLANETARY SCIENCES

The MIT Center for Meteorology and Physical Oceanography has presented its Rossby Award, which honors an MIT thesis for distinction, to Roger Atkinson, ScD '93, for "An Observational Study of the Austral Spring Stratosphere: Dynamics, Ozone Transport, and the 'Ozone Dilution Effect.'" The selection committee said Atkinson's work is the most comprehensive and sophisticated study to date of southern hemisphere ozone transport. Atkinson is now at the Bureau of Meteorology Research Centre in Melbourne, Australia. . . . Robert Burpee, SM '66 (XIX), PhD '71 (XIX), is the new director of the National Hurricane Center in Dade County, Fla. Previously, Burpee was the director of the hurricane research division of the National Oceanographic and Atmospheric Administration's Atlantic Oceanographic and Meteorological Laboratories. One of his projects has been measuring the weather conditions surrounding hurricanes in an attempt to improve storm forecasts. . . . Navy Commander David M. Schubert, SM '90, recently assumed command of attack submarine USS Chicago, homeported in San Diego. As commanding officer, Schubert is in charge of more than 130 sailors aboard the 360-foot-long submarine. Schubert reported to the Chicago after successfully completing his most recent assignment as the operations officer for the National Military Command Center with the Joint Staff in the Pentagon. Whether operating near a coast or in the deepest oceans, Schubert's submarine has the ability to launch Tomahawk cruise missiles, participate in special operations, and gather valuable information without being detected, making it an indispensable part of U.S. naval forces. Before going to work at the Pentagon, Schubert put in several years of sea duty including a tour as executive officer of the fleet ballistic missile submarine USS Stonewall Jackson. Schubert also served as engineering officer aboard the Chicago. He joined the Navy in June 1977. Schubert is married to Pamela Smith Schubert and has two daughters, Helen and Karen. . . . The Association of Alumni and Alumnae was notified that George Bruce Brown, SM '59, of Dorval, Quebec, died on October 13, 1994. No further details were provided.

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## OCEAN ENGINEERING

Rear Admiral Walter H. Cantrell, SM '65, NE '65, writes: "I retired from the U.S. Navy on April 1, 1995, after 37 years of service as a

commissioned officer. My last assignment was commander of Space and Naval Warfare Systems. This was preceded by tours in Naval Sea Systems Command in areas of design, construction, and maintenance of nuclear submarines. My plans for the next application of my MIT education are still in the formative stage." . . The Association of Alumni and Alumnae was notified that William Henry Cross, SM '48, of Signal Mountain, Tenn., died on July 31, 1994. He had been retired from Combustion Engineering. No further details were available.

Alumni/ae may send information for Course News to <mitalum@mitvmc.mit.edu>.

## XIV ECONOMICS

President Bill Clinton intends to nominateformer MIT Professor Lawrence Summers, '73, the undersecretary for international affairs at the U.S. Department of the Treasury, for the department's position of deputy secretary.

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## XV MANAGEMENT

Perry D. Cohen, SM '71, PhD '79, reports: "I am working in Washington, D.C., as a man-

agement consultant in strategic planning, evaluation, and organization development in the health industry. I was recently elected as a trustee of the Consumer Health Foundation, a new foundation dedicated to the support of consumer information and consumer protection in health care."

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#### **SLOAN FELLOWS**

Elisabeth A. Zinser, SM '82, president of the University of Idaho, was nominated as chancellor for the University of Kentucky's main campus in Lexington. Zinser, who served on UK's faculty briefly during the 1970s, would become the first female chancellor of the campus, which has more than 1,000 faculty members and about 20,000 students. Zinser, a Pennsylvania native, is a Stanford University graduate, has a master's in nursing from the UC/San Francisco, and a doctorate in educational psychology from the UC/Berkeley. As the main-campus chancellor at UK, Zinser would oversee a \$300 million annual budget

Duncan Mitchell, SM '93, has been appointed deputy project director for the Wandoo Alliance in Perth, Australia. The alliance, which includes Ampolex, Brown & Root (Mitchell's employers), Ove Arup, and Leighton contractors, plans to develop an oilfield in the northwestern shelf.

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## LEARNING TO THINK AT MIT



### The Idea Factory

by Pepper White

When Pepper White enters MIT, one of his professors tells him that it does not much matter what he studies there. What MIT will do is teach him how to think. The Idea Factory is his revealing insider's account of being a graduate student at America's most prestigious and demanding technological university; even more, it is the story of Pepper White's coming-of-age in a relentless academic pressure-cooker. *Paperback*, 313 pages, \$11.95

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-Boston Herald

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#### MANAGEMENT OF TECHNOLOGY

Leonardo Pintos, SM '93, manages the Industrial Engineering Department of The Techint Group. He writes: "I recently carried out some benchmarking studies and had the opportunity to visit some steel companies in the Great Lakes area. I was happy to contact a few of my former classmates and regretted not being able to get to all the American MOTs." His wife, Male, and children, Gonzalo and Paula, "are doing well." The entire family is enjoying their new home in San Nicolas, Argentina, and is awaiting the arrival of a third child, a boy. He invites his former classmates "to visit the Bariloche's slopes, because they're really marvelous." . . . Kevin Paul Tyra, SM '82, stopped by the MOT office with his twin boys to visit. Tyra is the general manager of the Jet Process Corp. in New Haven, Conn. Jet Process, a start-up company, provides radical technology in thinfilm deposition. He and his wife have sold their Boston home and are moving to Connecticut. They have nicknamed their one-yearold boys "the swarm." We were sorry to learn that Elizabeth, the Tyra's first child, has been undergoing treatment for leukemia at the Dana-Farber Cancer Institute. The good news is that she is responding well to the treatments! Tyra also told us that Steve Ehrler, SM '93, his wife, Rae Ann, and daughter, Katie, visited for a week in April and helped with the care of the children. Tyra said: "Their help was much appreciated, and we enjoyed renewing our friendships." We wish Elizabeth well! . . . Ann Kang, SM '90, emigrated from Hong Kong to Vancouver, B.C., after five years of working as a project manager. She and Timothy Ng, an obstetrician and gynecologist, were married on July 1st. Ng is practicing in Maple Ridge, B.C. . . . Guy Hatch, SM '94, informed us that he has recently been made the director of the Management of Technology Team at the United Technologies Research Center. The team was created to "enhance the identification of MOT activities and to accelerate their execution to help UTC's business units achieve a significant competititve advantage." Hatch also said he has spoken with the head of corporate executive recruiting "how MOTs can become part of our hiring mix-what they have to offer and how this fills some gaps we have." . . . Luis Rendon, SM '91, and his wife, Adriana, visited with former classmates over dinner at Legal Seafood in Kendall Square in April. Galeb Daouk, SM '91, his wife, Rima, and their two children; Pete Dunbeck, SM '79 (XVI), SM '91, his wife, Kathy, and their three kids; and Audie Hittle, SM '91 and his wife, Karina, attended. Rendon updated the group on the Mexican economy and his company's recent success in the export market.— MOT Program, MIT, Room E52-126, Cambridge, MA 02139; e-mail: <mitmot@sloan.mit.edu>

### AERONAUTICS AND ASTRONAUTICS

Professor Laurence R. Young, ScD '62, of the MIT Department of Aeronautics and Astronautics, has received the Paul T. Hansen Award from the Aerospace Human Factors Association. The award was presented for significant contributions to human factors research in the aerospace environment. Since the late 1960s, Professor Young has been a leader in research into space motion sickness, working through the Man-Vehicle Laboratory, which he headed for many years. In 1993, he was the alternate payload specialist and



John Lordi

ground communicator for Spacelab. . . . John Lordi, '61, SM 61, was appointed as the executive director of the Calspan/University at Buffalo Research Center (CUBRC). With over 30 years at Calspan, John has managed and performed research in high-speed flight, rocket and gas-turbine propulsion, bal-

listic missile defense, and environmental sciences. For the last few years, John has worked closely with CUBRC on many projects.

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## NIII POLITICAL SCIENCE

Among the newest Distinguished Visiting Lecturers at the National Foreign Affairs Training Center is Professor Emeritus Lincoln P. Bloomfield. He was recently named to the post by the Foreign Service Institute of the Department of State in recognition of the contributions he has made over the years to its training programs. Bloomfield is now a senior staff member at the MIT Center for International Studies, where he specializes in international conflict and governance. . . . The School of Oriental and African Studies of the University of London has chosen The Child and the State in India (Princeton University Press, 1991) by Professor Myron Weiner as the winner of the school's Edgar Graham Book Prize for 1994. The prize is awarded every two years for a work of original scholarship on agriculture and/or industrial development in Asia and/or Africa. Weiner is Ford Professor of Political Science.

William Alfred Streat, SM '49, died Sunday, February 6, 1994, at the age of 73 in Greensboro, N.C. Streat practiced architecture for 42 years in North Carolina, South Carolina, and Virginia. Churches, private residences, and historic restorations predominated among his designs. He was also certified by the U.S. Defense Department to design buildings protected against natural and nuclear disasters. Streat served as professor and chairman of the Architectural Engineering Department at North Carolina Agricultural and Technical State University from 1949 until his retirement in 1985. The department grew from 20 students to 200 under his leadership and included a tenfold increase of faculty and the addition of a master's program in architectural engineering. Since his retirement from university teaching, he continued in a limited architectural practice, and, with his wife, became actively

## CourseNews

involved as a benefactor to the United Negro College Fund and to college scholarship programs at St. Paul's College, Hampton University, and North Carolina Agricultural and Technical State University. He served on the Board of the I.M. Marteena Loan-Grant Scholarship Fund at U.C. A & T State University, where he served on the boards of the Greensboro Cerebral Palsy School and the recently organized Canterbury School in Greensboro established by the Episcopal Church. During World War II, he worked as a draftsman in the Civil Service in the General Infantry of the Army. After joining the Army Air Corps he served as a B-25 pilot and officer. His other affiliations included the American Institute of Architects, the American Society for Engineering Education, and the National Technical Association.

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## XVIII MATHEMATICS



**Joel Moses** 

MIT Professor Joel Moses, PhD '67, dean of the School of Engineering since 1991, was named provost of the Institute. Moses succeeds Professor Mark S. Wrighton, who stepped down to become chancellor of Washington University in St. Louis. Upon his appointment, Moses, a mathematician who

has concentrated on computer science and engineering, said: "I am very pleased at the confidence the president has shown in me. Chuck and I agree that a fundamental challenge in the coming years is to redefine a research university, and its relationship to the federal government and industry. Fifty years ago, Vannevar Bush, '16, promulgated the vision of federal support for university research and, implicitly, for the education of undergraduate and graduate students for the good of the country. That compact is now being questioned." As the dean of engineering, Moses has stressed long-range planning and what he calls "Big E" engineering in which engineers are expected to integrate all aspects of a problem. He has been a leader in the move to have five-year bachelor's/master's programs in engineering, which at MIT now include the departments of Electrical Engineering & Computer Science, Civil & Environmental Engineering, Ocean Engineering, and Aeronautics & Astronautics. The MIT School of Engineering has been consistently ranked No. 1 by U.S. News and World Report during his tenure.

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## XXI HUMANITIES

Alan P. Lightman, a professor of science and writing in the Program in Writing and Humanistic Studies and a senior lecturer in the Department of Physics, has been appointed the first John E. Burchard Professor of Science and Writing. Lightman wrote Good Benito (Pantheon, 1995) and Einstein's Dreams (Pantheon, 1993). He has been described by a critic as "equally at home in the realm of human passions and in the rarified world of atoms and equations." Head of the writing program for four years, Lightman's area of research is theoretical astrophysics. He has written two textbooks and his essays have been published in the New Yorker, the New York Times, Harper's, and Science '86, among others. Trained as an architect at MIT, the late Dean Burchard, '23, SM '25, served as the first dean of the School of Humanities and Social Science from 1948 to 1964. He designed Hayden Library and also wrote MIT in World War II: QED (Technology Press 1948), the story of the Institute's role in World War II.

MIT Professor John Harbison is one of three MIT professors recently named Institute Professor, a title that MIT reserves for about 12 scholars of special distinction. The honor is initiated by the faculty and bestowed jointly



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by the administration and faculty. In addition to the prestige associated with the title, an Institute Professor has a distinctive measure of freedom to define the scope and nature of his or her responsibilities. Reporting directly to the provost rather than to a department head or school dean, the Institute Professor does not have regular departmental or school responsibilities. Summarizing the faculty's recommendations, Professor Robert Jaffe, chair of the faculty, said Harbison has managed "the almost impossible task of combining sophistication and accessibility in his music. He has written music at once profound and witty, embracing folk themes, formal structures, and deep social concern." A member of the MIT faculty since 1969, a full professor since 1979, and Class of 1949 Professor in the Music and Theater Arts Section of the Department of Humanities since 1984, Harbison has been instrumental in bringing the best young faculty to the Music Section and the most distinguished senior composers and performers to MIT as guest artists. He has been deeply involved in the admissions process. In 1987, Harbison was awarded the Pulitzer Prize for his oratorio, Flight into Egypt, which used the story of the Nativity to explore the situation of the poor and homeless in contemporary society. One of Harbison's colleagues noted that he contributed all the fees for that piece to a Boston shelter for the homeless. In 1989, Harbison received a \$305,000 fellowship from the John D. and Catherine T. MacArthur Foundation. Last year, he received the James R. Killian Faculty Achievement Award, also bestowed by MIT faculty colleagues.

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### LINGUISTICS AND PHILOSOPHY

Noam Chomsky, professor of linguistics and philosophy, is the subject of a two-and-a-half-hour documentary. Called "Manufacturing Consent" after the title of one of his books, the documentary examines the key tenets of Chomsky's writings and ideas over the past 30 years, especially regarding how the American media functions. "Manufacturing Consent" is available from Home Film Festival in Allentown, Pa., a mail-order video rental company.

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## TPP TECHNOLOGY AND POLICY PROGRAM

Miguel M. Dembinski, SM '88, is financing aircraft sales in Paris and expects to relocate to New York soon. . . . At James Madison University, James Winebrake, SM '91, is an assistant professor in the College of Integrated Science and Technology (CSAT). He informs us that CSAT was recently awarded more than \$150 million in state funds to build a new "campus" adjacent to JMU. The college expects to enroll more than 3,000 new students (in addition to the current university student population of about 10,000) by the year 2002. . . . In September 1995, Robert Margolis, SM '92 (VI, TPP), will begin the doctoral program in Science,

Technology, and Public Policy at the Woodrow Wilson School at Princeton University. . . . Kazuyoshi "Kazu" Matsunaga, SM '92, attended the Conference of Non-Proliferation Treaty in New York in May 1995. Before returning to Tokyo on May 4, he stopped by the TPP Office to say hello. . . . Lola Matysiak, '91 (I), SM '92, left her position at Los Alamos National Laboratory on May 5 and drove cross-country to New York to marry Rob Lohr on June 17, 1995. After a honeymoon in Alaska, the newlyweds moved to Boston. . . . Best wishes to Michael "Mick" Rookwood, SM '92 (II, TPP), and Karen Seagal who married in April 1995. . . Congratulations to Lisa Prosser, SM '92 (XV,TPP), and Walid Yassir who married in May 1995. In September 1995, Prosser is entering a doctoral program in health policy at Harvard University. . . . François Cohas, SM '93 (XVI, TPP), and Amy Liebowitz were married on July 22. vAs of September 1995, they will reside in New York while Francois attends Columbia Business School. . . . Congratulations to Kory Sylvester, SM '94 (XXII, TPP), whose master's thesis "A Strategy for Weapons-Grade Plutonium Disposition" was recognized with the Klegerman Scholarship Award for Environmental Excellence. . . . Benoit Bazin, SM '95, is an engineer with the Ministry of Finance in France. Before returning to Paris, Benoit, Laure, and Gabrielle visited Canada. . . . Nick Gertler, SM '95, will begin Harvard Law School in September 1995. . . . Scott Wright, SM '95, his wife, Michelle, and son, Max, are moving to Colorado where Scott will join the National Renewable Energy Laboratory.—Richard de Neufville, TPP, MIT Room E40-252, Cambridge, MA 02139; e-mail: <tpp@mit.edu>

Alumni/ae may send information for Course News to <mitalum@mitvmc.mit.edu>.

## STS PROGRAM IN SCIENCE, TECHNOLOGY & SOCIETY

Jed Z. Buchwald, professor in the Program in Science, Technology, & Society and a codirector of the Dibner Institute, was among 24 people awarded grants by the John D. and



Jed Buchwald

Catherine T.
MacArthur Foundation in June. The foundation's
MacArthur Prize Fellows program
awards cash grants, also known informally as "genius grants," to highly talented individuals working in a wide range of fields. Buchwald was honored with a grant of \$285,000 to be dis-

persed over five years for examining "the history of science in terms of its great ideas and the figures who generate them." Buchwald, the 11th person connected with MIT to have won one of the awards, joined MIT three years ago as the first Bern Dibner Professor of the History of Science and Technology and a co-director of the Dibner Institute, an advanced research center with one of the world's premier private collections of historical scientific books, manuscripts, instruments,

and works of art. Buchwald, who originally intended to become a physicist, shifted his focus while taking history of science courses at Princeton with Thomas S. Kuhn, the Laurance S. Rockefeller Professor Of Philosophy and History of Science Emeritus at MIT. Buchwald's research is currently focused on the history of physics since the 17th century. He has published numerous articles as well as three books: From Maxwell to Microphysics, The Rise of the Wave Theory, and The Creation of Scientific Effects, all available from the University of Chicago Press. He holds a BA from Princeton University and a PhD in the history of science from Harvard University. Before coming to MIT, he was the director of the University of Toronto's Institute for the History and Philosophy of Science and Technology.

#### Deceased

The following deaths have been reported to the Alumni/ae Association since the *Review* last went to press:

Samuel Eugene Lunden, '21; June 10, 1995; South Dennis, Mass.

Vernon Eleazer Whitman, '22, SM '24; January 21, 1995; Pomona, Calif.

Edward Battey, '23; May 4, 1995; West Yarmouth, Mass.

David Minott Houston, '23, SM '25; March 30, 1995; San Mateo, Calif.

Henry Davenport Bevan, '25; November 19, 1994; Swarthmore, Pa.

Moorhead C. Kennedy, '25; February 9, 1995; New York, N.Y.

George Ashmun Morton, '26, SM '28, PhD

'32; May 15, 1995; Walnut Creek, Calif. Thomas McKue Rowlands, '26; November 4, 1994; Honolulu, Hawaii

Austin Robinson Caverly, '28; April 17, 1995; Fort Lee, N.J.

Roberta Burnice Halligan, '28; April 5, 1995 Abraham Woolf, '28; May 9, 1995; Brookline, Mass.

Edward Joy Marnock, '30; February 9, 1994; Winter Park, Fla.

Lester Kramer Meyer, '30; February 11, 1995; Godfrey, Ill.

Walter Walery Soroka, '30, SM '33, ScD '45; May 22, 1995; Duxbury, Mass.

Richard Thomas Kropf, '31; January 16, 1995; Columbus, N.C.

Julio De La Fuente, '33; July 22, 1994; Monterrey, Mexico

George Parmakian, '33; May 14, 1995; Worcester, Mass.

Chester Edward Bond, '35; January 6, 1995; Sun City, Calif.

Alexander Joseph Rogowski, '34; May 8, 1995; Smithfield, R.I.

Edward Sieminski, '34; May 5, 1993; Fullerton, Calif.

Henry Clyde Johnson, '36, SM '36; June 9, 1995; Bloomfield Hills, Mich.

William Prudente, '36; May 9, 1995; Belmont, Mass.

Jonathan Billings Cobb, '37; January 14, 1994; New Berlin, Wisc.

Robert Lloyd Evans, SM '37; May 28, 1995; Strafford, N.H.

Howard Elwyn Webster, SM '37; January 10, 1995; Troy, N.Y.

Albert St. Clair Wynot, '37; January 27, 1995;

Walpole, Mass.

Charles Jephthiah Jeffus, SM '39; August 28, 1994: Greensboro, N.C.

1994; Greensboro, N.C. Metchie Joseph Budka, '40; May 17, 1995; Bronx, N.Y.

William Bommer, '44; June 9, 1995; South Dartmouth, Mass.

Shelton Morris Johnson, '46; April 15, 1995; Orleans, Mass.

George Brown, SM '47; January 28, 1995; Lakehurst, N.J.

Robert Paul Epple, PhD '47; May 2, 1995; Rockville, Md.

William Henry Cross, SM '48; July 31, 1994; Signal Mountain, Tenn.

George Jernakoff, '49, SM '50; April 13, 1995; Loudonville, N.Y.

Charles Calder Park, '50; January 28, 1994; Rochester, N.Y.

Frank H. Thomas, '51; March 19, 1995; Naples, Fla.

Richard Lundelius Best, SM '52; September 11, 1994; Wayland, Mass.

Wesley Joseph Haywood, '52; May 8, 1994; Concord, Mass.

Kenneth Ray Geiling, '53; March 14, 1995; Sayre, Pa.

Jacek Jedruch, SM '58; March 17, 1995; Summit, N.J.

Harry Charles Nottebart, '60; March 26, 1995; Richmond, Va.

Joseph Lawrence Lelli, SM '61; May 20, 1994; Bloomfield, Mich.

Charles Albert Bridges, '63; January 21, 1995; Urbana, Ill.

Alan Oliver Ramo, '63; May 19, 1995; Dallas, Tex.



## HERE MIGHT A NAME BEST LIVE?



The name of a deceased MIT alumna or alumnus can be linked to the Institute through gifts made by classmates, colleagues and family. Memorial gifts can be unrestricted or directed toward scholarships, research or any program of the Institute. The Institute notifies bereaved families of the name of each donor, and each gift becomes a part of MIT's permanent record.

Named endowed funds whose income supports the work of the Institute in perpetuity can be established with larger gifts. If you would like information on ways of expressing sympathy through a memorial contribution, or on establishing a named endowment fund, please contact Betsy Millard, MIT Room E38-202, Cambridge, MA 02139 or call (617) 253-8059.

# PuzzleCorner

ince this is the first issue of a new academic year, I once more review the ground rules under which this department is conducted.

In each issue I present three regular problems (the first of which is chess, bridge, go, or computer-related) and one "speed" problem. Readers are invited to submit solutions to the regular problems, and three issues later, one submitted solution is printed for each problem; I also list other readers who responded. For example, solutions to the problems you see below will appear in the February/March issue and the current issue contains solutions to the problems posed in May/June. Since I must submit the February/March column in November, you should send your solutions to me during the next few weeks. Late solutions, as well as comments on published solutions, are acknowledged in subsequent issues in the "Other Respondents" section. Major corrections or additions to published solutions are sometimes printed in the "Better Late Than Never" section, as are solutions to previously unsolved problems.

For speed problems, the procedure is quite different. Often whimsical, these problems should not be taken too seriously. If the proposer submits a solution with the problem, that solution appears at the end of the same column in which the problem is published. For example, the solution to this issue's speed problem is given below. Only rarely are comments on speed problems published.

There is also an annual problem, published in the January issue of each year; and sometimes I go back into history to republish problems that remained unsolved after their first appearance.

In response to my comment about our son David's then-upcoming Bar Mitzvah, Edgar Rose writes that, as the father of two daughters and no sons, he, unlike me, "was spared the trauma of a

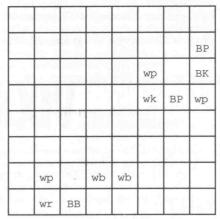


SEND PROBLEMS, SOLUTIONS, AND COMMENTS TO: ALLAN GOTTLIEB NEW YORK UNIVERSITY 715 BROADWAY, 10TH FLOOR NEW YORK, N.Y. 10012, OR TO: GOTTLIEB@NYU.EDU social Bar Mitzvah but had to contend with two equally traumatic weddings. Fathers cannot win!" While I cannot not dispute his conclusion, David's Bar Mitzvah was fairly enjoyable for his parents. The only (mild) trauma came in paying the bills. Moreover, nowadays, at least in our neighborhood, having only daughters has little effect: Bat Mitzvahs are equally big deals. Weddings I cannot speak about for (hopefully) quite a few years.

#### **Problems**

**OCT 1.** We begin with a chess problem from Richard Freedman.

White to move and mate in 2.



OCT 2. Here is a pair from Nob Yoshigahara. Consider a number factored into primes.

$$a = b \cdot c \cdot d \cdot \cdot \cdot$$

The first goal is to find an example where the equation contains all nine digits 1–9, exactly once each. The second goal is similar but involves the ten digits 0–9.

OCT 3. Bob High first had this problem appear in *New Scientist*. Uncle Fibo is on a brief, enforced vacation from the racetrack. Missing the excitement of the turf, he has come up with a substitute: he and his associates Earl, Garth, and Hal have among them a single coin. They flip this coin repeatedly, producing a sequence of heads and tails. Each man has a "horse"—a sequence of three

heads or tails—and the one whose horse appears first wins the "race."

For example, suppose Uncle Fibo chose HTH and Earl chose THT, and these two had a race. If the coin produced the sequence,

#### HHTTHT...

then Earl would win.

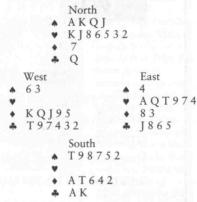
On the particular day of interest to us, the men have chosen the following horses: Earl, HTT; Uncle Fibo, HHT; Garth, THH; and Hal, TTH. They run four separate races: Earl against Uncle Fibo; Uncle Fibo against Garth; Garth against Hal; and Hal against Earl. Assuming their coin is fair, who would you expect to win each race?

#### Speed Department

Sidney Shapiro has a box containing P dollars, a value known to the owner but not to you. For B dollars the owner will give you the box plus a bonus of P/2 dollars provided that B>P. You can make only one bid. What should B be?

#### Solutions

M/J 1. We begin with a Bridge Problem from Jorgen Harmes, who wants you to make 6 spades when West leads the 10 of clubs.



Rick Wasserman has found two successful lines of play. He writes:

South should take two club tricks, then the ace of diamonds, then ruff three diamonds in dummy, returning to hand twice with hearts ruffed high. At trick 9, with the lead in dummy, there are two possible lines. The intended answer is: ruff another heart high back to hand, then ruff the last diamond in dummy leaving

Continued on Page MIT 50

# Technology Review Books Salutes MIT Authors

#### Up the Infinite Corridor MIT and the Technical Imagination

by Fred Hapgood

This lively, eminently readable account of MIT's engineering research will stir up memories while bringing readers inside some of the current projects happening around the Infinite Corridor. Delving into MIT's rich, sometimes bizarre history, Up the Infinite Corridor explores the folkways of undergraduate life, as well as the unique sense of humor that emerges from the

pressures and insecurities of the place where everyone's intellectual accelerator is wired to the floor.

Hardcover, 203 pages,

# The Language Instinct

by Steven Pinker Professor and Director of the Center for Cognitive Neuroscience at MIT

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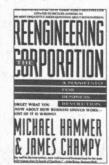
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#### 900 MHz breakthrough!

# New technology launches wireless speaker revolution...

Recoton develops breakthrough technology which transmits stereo sound through walls, ceilings and floors up to 150 feet.





Breakthrough wireless speaker design blankets your home with music.

by Charles Anton

f you had to name just one new product "the most innovative of the year," what would you

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Recoton was able to introduce this whole new generation of powerful wireless speakers due to the advent of 900 MHz technology. This newly approved breakthrough enables Recoton's wireless speakers to rival the sound of expensive wired speakers.

Recently approved technology. In June of 1989, the Federal Communications Commission allocated a band of radio frequencies stretching from 902 to 928 MHz for wireless, in-home product applications. Recoton, one

of the world's leading wireless speaker manufacturers, took advantage of the FCC ruling by creating and introducing a new speaker system that utilizes the recently approved frequency band to transmit clearer, stronger stereo signals throughout your home.

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Just imagine listening to your stereo, TV, VCR or CD player in any room of your home—without running miles of speaker wire. Plus, you'll never have to worry about range because the new 900 MHz technology allows stereo signals to travel dis-

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#### Full dynamic range.

The speaker, mounted in a bookshelf-sized acousti-

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technology provides static-free sound in virtually any environment. The speakers are also self-amplified; they can't be blown out no matter what your stereo's wattage.

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Recoton's transmitter sends music through walls to wireless speakers over a 70,000 square foot area.

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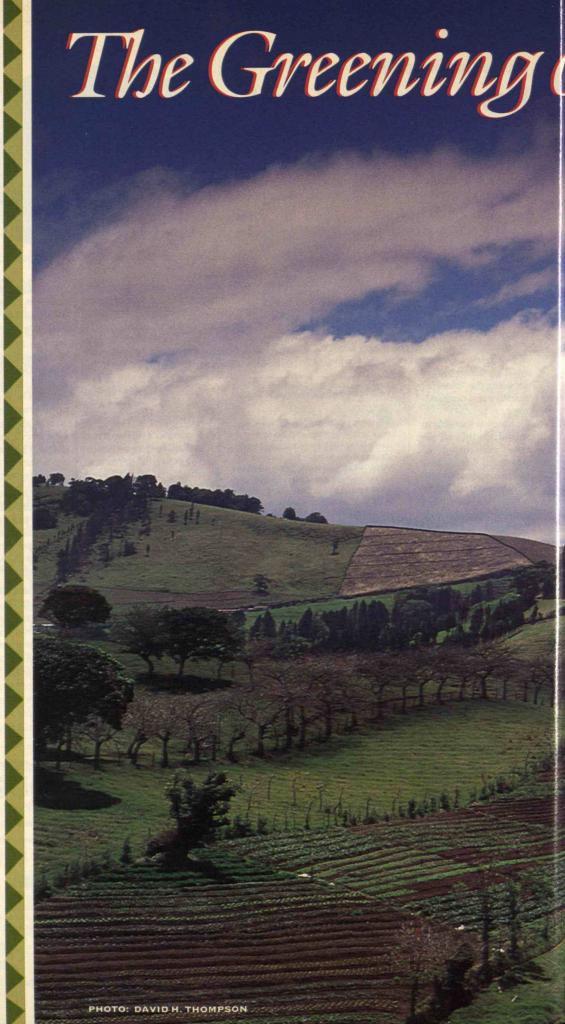
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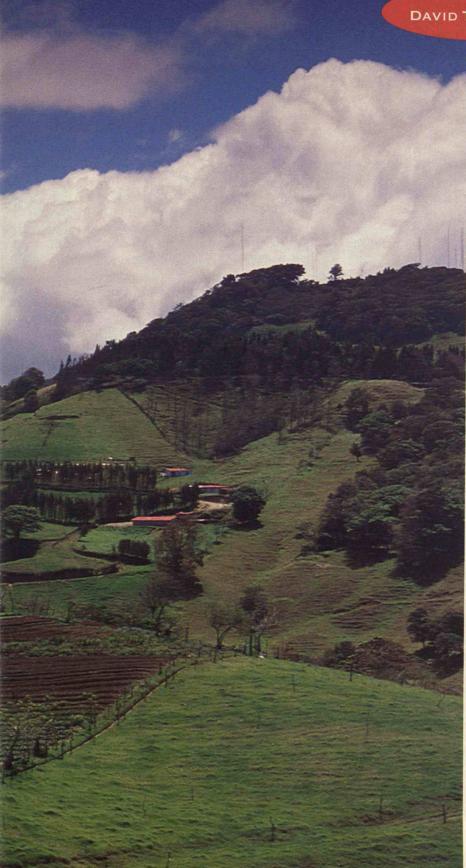


Costa Rica is the first country to bet its entire economic future on the power of sustainable development. Has it found the formula for success?



# f Costa Rica

BY
DAVID TENENBAUM



OON after his narrow election victory last year, Costa Rican President José María Figueres made what might have seemed like just another token pledge to pursue sustainable development. "We will build a constructive alliance with nature," he boldly proclaimed, and raise Costa Rica's standard of living without depleting its resources.

Though sustainable development received a great deal of lip service when many countries enthusiastically endorsed the concept at the 1992 Earth Summit in Rio de Janeiro, Figueres insists that his campaign to remake Costa Rica is not mere rhetoric. With a military bearing reminiscent of his West Point education, he answers skeptics by maintaining that "Costa Rica is already doing it, in national park policy, in taxes, in energy, in education."

In fact, during the first year of his term, which is limited to four years by the Costa Rican constitution, Figueres signed a flurry of executive orders and legislative proposals to convert the platitudes of sustainable development into a guiding vision for his country. His initiatives include establishing a new carbon tax devoted to restoring tropical forests on now-idle cow pastures, imposing a new electricity tax to promote energy conservation, canceling a planned oil-fired electric generating facility in favor of a new geothermal plant, and halting the development of a nonsustainable Pacific coast resort hotel and an environmentally hazardous paper mill and port.

Figueres also committed himself to more than double the size of Costa Rica's national parks

and wildlife reserves. To that end, the new president has created two new national parks and asked a commission to set the final boundaries for conservation areas that will encompass 25 percent of the country. When all the land is finally set aside, Costa Rica will rank second only to Ecuador among countries with the highest proportion of nationally owned nature reserves. The parks would increase tourism, which last year surpassed bananas as the country's



leading source of revenue. And they would shelter an estimated half-million species, many of which Figueres hopes can be sustainably harvested for their pharmaceutical, chemical, or genetic properties.

Some of the leading advocates of ecologically sound development give Figueres's plan excellent reviews. Maurice Strong, secretary-general for the Earth Summit, formally the U.N. Conference on Environment and Development, calls it a "pilot project for the implementation" of the conference's goals. Noel Brown, North American regional director of the U.N. Environment Programme (UNEP), says Figueres has devised "a daring plan" for a country that is a "wonderful laboratory" for sustainable development: "it's small, well-ordered, with a fairly good middle class, and a very interactive society with a functioning democracy, a free press, universal education, and an egalitarian tradition."

What may be even more significant, according

to Daniel Janzen, a University of Pennsylvania biologist who has lived half of each year in Costa Rica for about 30 years, is the government's level of commitment. "On his first day as president of Costa Rica, Figueres organized a symposium for all his ministers who deal with natural resources in any way—education, roads, tourism, natural resources—and said, 'I'm taking this country in the direction of sustainability. What are each of you going to do to make that happen?'"

"Figueres has established himself as the leader, the motivator, and that gives everyone in his government a frame of reference," says Brown. For example, he attends three-day meetings, four times a year, with 150 representatives of business, government, nongovernmental organizations, and labor unions to review his vision of sustainable development. "Whereas in many nations there's no integrated leadership," he says, "Figueres is creating a framework for cooperation" to pursue an integrated strategy.

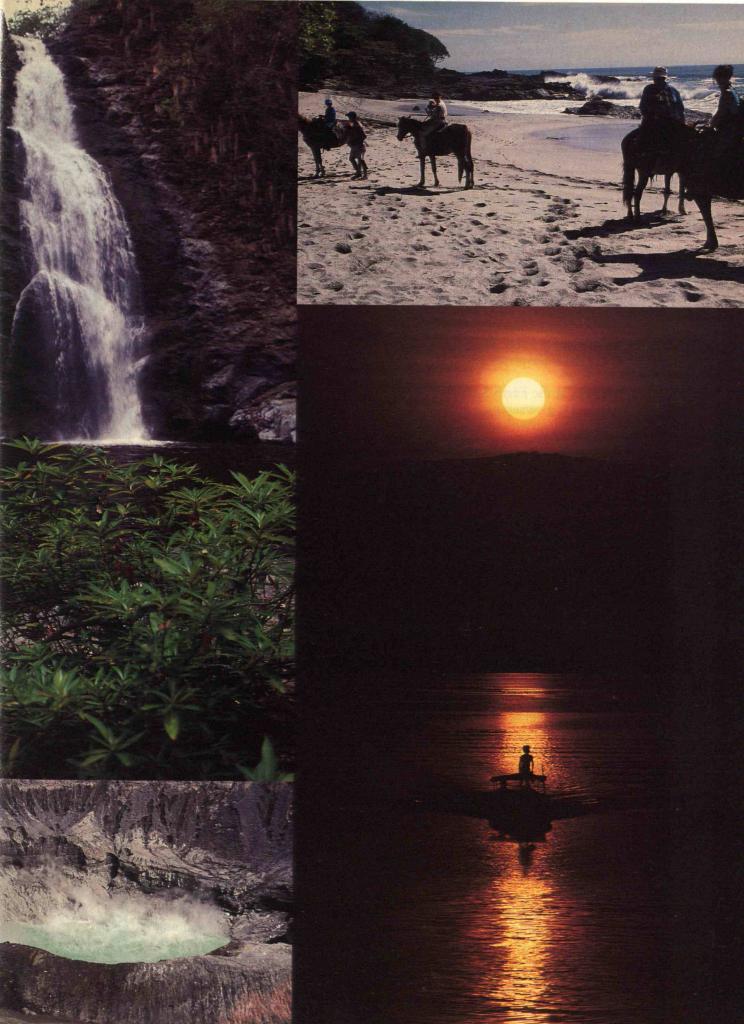
Janzen argues that Costa Rica is one of very few nations that has taken the concept of sustainable development seriously. "There's not a single sustainable country in the world, and this one has just said, 'We have become a guinea pig: If we fail, everybody will see every aspect of it as we go down in flames. If we succeed, it's all there for the world's people to use in any way they want."

#### Accepting the Challenge

Today's notion of sustainable development has its roots in the conservation movement, which 50 years ago essentially meant saving creatures that were pretty or could be hunted. In the 1960s, environmental attention shifted to pollution control. And by the 1970s, the focus had broadened to ensuring the survival of ecosystems and species. Then in the 1980s environmentalists began to realize that their favorite preservation technique—national parks—conflicted with the need of developing countries to

Under Costa Rica's sustainable development plan, the country's national parks and wildlife reserves will double in size and thus enhance tourism, already the leading source of foreign exchange. Some scenic sites include (counterclockwise from top left) a waterfall near Montezuma on the Nicoya Peninsula, a volcano in Poas National Park, the Nicoya Bay at sunrise from Punterenas, and a beach near Montezuma.

DAVID TENENBAUM is a freelance writer and photographer who specializes in environmental issues.



exploit natural resources to escape severe poverty. At the same time, residents and leaders of those countries were finding that massive environmental degradation—including deforestation, and erosion and degradation of soils—was exacting an economic toll.

These twin realizations set the stage for the merger of the environment and development embodied in a 1987 report from the World Commission on Environment and Development called "Our Common Future." This so-called Brundtland Report—named after Gro Harlem Brundtland, now the prime minister of Norway, who chaired the commission—advocated a path toward development "that sustained human progress not just in a few places for a few years, but for the entire planet into the distant future."

In 1992, conferees at the Earth Summit developed Agenda 21, a sweeping action plan for green economic growth grounded in social justice. Agenda 21 offered suggestions on a range of issues, including eliminating poverty, changing consumption patterns, managing hazardous wastes, and safeguarding oceans. Since it was intended to apply worldwide, it naturally relied heavily on generalities. For example, to fight deforestation, Agenda 21 suggested expanding protected areas, enhancing the skills of people and institutions working in forests, conducting forest research, and developing tree plantations to ease pressures on natural forests. To slow global warming, it suggested using economic and social measures to increase energy efficiency. And to reduce the environmental impact of construction, it suggested using indigenous, renewable building materials.

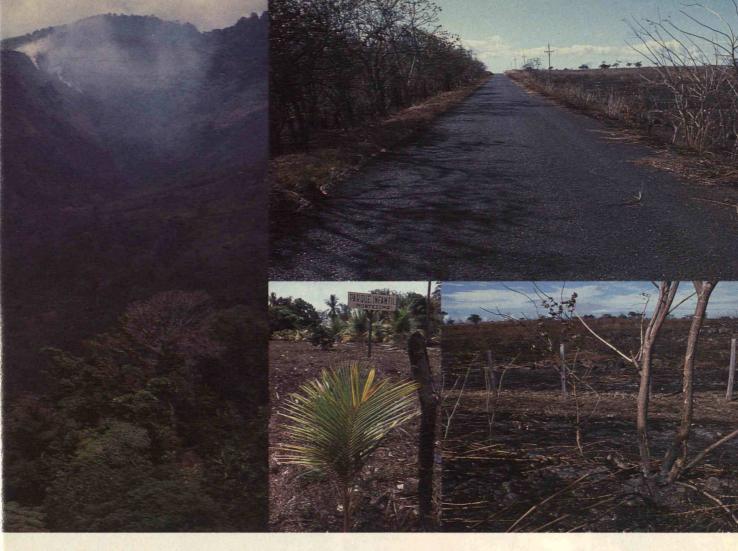
The challenge was clearly to transform the generalities of Agenda 21 into specific laws, programs, and institutions. And several countries—including the Netherlands, Denmark, Canada, and Australia—have attempted to do just that by setting numerical goals for pollution indicators from agriculture, industry, and urban development. But Costa Rica is the first country to bet its entire economy on the concept.

Yet, as bold as this move may seem, it may be less risky for Costa Rica than perhaps any other nation on the planet. As UNEP's Brown indicates, Costa Rica is the ideal place for a pilot project in sustainable development in both environmental and political terms. Its volcanic spine, which slopes westward to the Pacific Ocean and eastward to the Caribbean Sea, and its tropical Central American climate give it an enormous variety of ecosystems and an incredible 5 percent of global biodiversity on only 0.035 percent of the world's land area. It has a booming ecotourism industry that attracts visitors hoping to enjoy its lush natural beauty, a long tradition of support for tropical biology, and a commitment to conservation embodied in a national park system that already covers 11.9 percent of the land-scape, almost 2.5 times the global average.

Moreover, if successful and innovative politics runs in the family, Costa Rica has the ideal president. In 1948, the current president's father, "Don Pepe" Figueres, abolished the national army, thus helping insulate Costa Rica from the military oppression that has afflicted the rest of Central America. The country spent its "peace dividend" on social programs, namely education, rural electrification, and health, observes Kenton Miller, director of biological resources at the World Resources Institute, and former director general of the International Union for the Conservation of Nature. As a result, the country boasts a 93 percent literacy rate, a respectable per capita income of \$2,000 per year, an infant mortality rate of 21 per 1,000 (the other Central American nations report between 30 and 89 per 1,000), and a life expectancy for citizens born today of 77.5 years, a figure that exceeds the world average by 10 years.

#### No Eco-Paradise

Despite such exceptional qualifications, Costa Rica is no modern-day Garden of Eden. After a half-century of rapid economic and population growth, it has reached its environmental limits. About the size of West Virginia, the country's population soared from 0.86 million in 1950 to 3.34 million today. The rate has slowed, but it is still rising 2.38 percent annually, well above the global average of 1.74 percent. Until the mid-1980s, Costa Rica's deforestation rate was one of the highest in the world, peaking at 100,000 acres per year. (The annual rate has now fallen to about 20,000 acres, since much of the remaining primary forest is within national park boundaries.) Most of the trees were cut to create pastures for cattle farming, an indus-



The deforestation rate in Costa Rica, recently among the world's highest, has dropped now that most remaining forests lie safely within national park boundaries. Yet farmers still slash and burn forest land for cattle grazing, as seen in the mountains east of San José (top left), at a rate of about 20,000 acres per year. The Guanacaste Conservation Area (top right) has been protected from such practices for the past decade, while the bordering field across the road has been repeatedly burned to kill seedlings (also shown in detail, bottom right). Meanwhile, Costa Rican residents are initiating grassroots replanting efforts, such as in a park that was once deforested land near Montezuma (above).

try that has since declined dramatically because of slumping beef prices.

Overall agriculture—including cattle farming, which continues to account for 20 percent of the gross national product—has also caused major environmental problems. For example, range fires set purposely to kill tree seedlings in pastures not only prevent regrowth of native, dry tropical forests but also destroy adjoining forest land. Pesticides in the vast banana plantations pollute nearby rivers. Even Cocos National Park, a remote refuge 300 miles off the Pacific Coast, is being overfished by shark fishermen.

Overall, Costa Rica's soils, forests, and fisheries were depleted to the tune of at least \$4.1 billion between 1970 and 1989, according to economist Robert Repetto of the World Resources Institute. In a 1991 study, Repetto arrived at this figure by totaling the costs of overfishing, loss of future timber harvest, and depletion of nutrients in the soil. "That Costa Rica's natural resources have deteriorated seriously is indisputable,"

Repetto wrote, "but the loss is not reflected in the national accounts." If it had been, he concluded, the capital loss would have represented a "25 to 30 percent reduction in potential economic growth."

#### Redefining the National Park

To succeed in his quest to sustainably develop Costa Rica's resources, Figueres believes it is vital to capitalize on the country's biodiversity. Thus he is creating eight vast conservation areas by enlarging and combining national parks and nature reserves into a system that will occupy one-fourth of the national landscape. While ecologically the rationale is to give rare species the large blocks of habitat they need to survive, philosophically the idea is to abandon the conventional rationale for national parks—preservation—and embrace sustainable use.

"The Smoky-the-Bear park is dead the world over," Janzen says, because it's too



expensive to "lock up" land when people need to make a living from it. Instead of using guards and fences to protect nature from people, the conservation areas in Costa Rica are supposed to earn a non-destructive profit from ecotourism and pharmaceutical harvesting. If the plan works, Janzen argues, Costa Ricans will want to protect a conservation area not for scientific, aesthetic, or moral reasons alone, but because it is the most profitable use of the land.

Perhaps the best way to understand this new approach is to visit the conservation system's pilot project, the 423-square-mile Guanacaste Conservation Area. Just south of Nicaragua, on the west coast, the area was formed in 1987 by joining three national parks into a single tract stretching from the Pacific Ocean past the continental divide and encompassing volcanoes, rivers, reefs, and forests. The biological endowment of this area, roughly half the size of Rhode Island, includes an estimated 333,000 species, which could represent a mind-boggling 3 percent of the world's biodiversity.

With good vehicles, modern buildings, new computers, and three field biology stations, Guanacaste provides an excellent base for researchers from the country's National Institute of Biodiversity (INBio), a nonprofit research organization established in 1989 to

catalog Costa Rica's organisms, to "rent" that biodiversity to potential users, and to fund conservation areas. Guanacaste's infrastructure and sheer number of species have made the area the site for INBio's all-taxonomic biological inventory, an \$80 million, five-year effort funded by the World Bank and other organizations, slated to begin in 1997. Perhaps the most significant innovation of the survey, aside from its audacious scale, is the decision to focus on lower organisms—fungi, bacteria, viruses, and parasites rather than on already welldocumented Costa Rican mammals and birds. Knowledge of these organisms will lead to a better understanding of the basic ecology of the conservation area and identify still more organisms with useful biological properties.

To further enhance the area's biodiversity, Guanacaste recently embarked on what is likely the world's largest ecological restoration project by attempting to regenerate 200 square miles of a highly endangered tropical dry forest that had been cleared for cattle grazing. Dramatically expanding such forests will sustain populations of organisms that INBio can offer to potential users as well as expand tourism to conservation land, which already attracts 60,000 tourists annually.

To help ensure the conservation area's longevity, employees give day-long field biology classes six times a year to about 2,000 high school students. The principal goal, says program director Luz María Romero, is "to change attitudes about nature, because the children who live around the park will be the adults who will make decisions about it in the future." Romero says the course stresses information instead of preaching. "We will go to a river, pull up a stone, and look at what is living there," she says. "We think that if a child understands that a river is a whole ecosystem, it will be easier to explain the dangers of polluting it."

Indeed, in the end, education may be the most powerful ally of sustainable development. "Not much knowledge is needed to deplete a forest," observes education minister Eduardo

Doryan, "but you need a lot more to sustainably develop the forest" by finding nondestructive uses for the plants, animals, genes, and chemicals within it.



Insect collectors (above) arrange boxes of samples (top right, opposite page) as part of a comprehensive effort by Costa Rica's National Institute of Biodiversity to inventory the tiny country's teeming varieties of plants, invertebrates, birds, reptiles, and other creatures—which account for an incredible 5 percent of the world's species on just 0.035 percent of its land. The agency hopes to identify organisms with powerful pharmaceutical properties and other useful attributes to prove the economic value of protecting biodiversity.

#### Beating the Bushes

Perhaps no organization has had greater success at finding such nondestructive uses for a region's biodiversity than INBio, which instituted the world's first national biological survey and signed the first contract guaranteeing royalties for products derived from a country's biodiversity. The organization is best known for a \$1.14 million deal with Merck and Co. to supply the drug giant with 10,000 biological samples for pharmaceutical testing. According to Janzen, the company obtains major advantages from the partnership. "The commercial world has been looking for a way to have a formal business relationship for reliable supply and identification of the samples," he says, "and to make sure nobody hauls them into court for violating national boundaries." Merck has not disclosed any discoveries from its INBio samples, but it did renew the agreement in 1994.

INBio's effort to catalog all of the country's organisms began when Janzen volunteered to train about 40 rural Costa Ricans. These so-called "parataxonomists" collect samples year-round at 23 locations in the national parks. After each 21-day stint, they return to INBio headquarters with some 10,000 samples, which the staff classifies, bar-codes, and logs into a computer. Taxonomists at INBio headquarters critique the work of each parataxonomist and offer suggestions for further searches.

Because INBio could not find commercial software that could store information on the country's estimated half-million species and all of their taxonomic groups, the agency collaborated with Intergraph Corp., of Huntsville, Ala., to develop a database to handle the task. Seeing an opportunity to sell the software to other biodiversity organizations and U.S. universities, Intergraph paid \$750,000 to tap INBio's knowledge. "We provided the hardware and software, they provided the expertise in specimen inventory and helped build the user interface," says Eleanor Bowman, project manager for Intergraph. "After the software was installed at INBio headquarters, INBio programmers continued refining it."

Wills Flowers, a Florida A&M entomologist who has collaborated with INBio for three years in efforts to identify new species, says the organization has set a new standard for taxonomy. INBio's comprehensive day-in, day-out collecting is producing unprecedented knowledge of the natural world. "Before, many people collected insects in the tropics by swinging a net at some convenient location, so all the knowledge of the natural fauna came from one or two areas," he says. "Now, we're getting extremely good coverage over a large number of natural areas."

Although the Merck contract has attracted the most attention, INBio has also signed an innovative contract guaranteeing royalties from a native plant—an extract from an undisclosed tree, a species whose bark contains a substance that kills nematodes. These parasitic worms eat the roots of banana trees, coffee plants, and other crops worldwide. While synthetic nematocides caused at least 164 poisonings in Costa Rica between 1986 and 1992, the natural product appears harmless to humans and other mammals. In return for providing supplies of the tree to the British Technology Group, a pharmaceutical firm that holds the patent on the natural nematocide, INBio received an exclusive license to produce and sell it in Costa Rica. Roughly 1,000 acres of trees will supply the chemical, creating jobs for farmers and plant breeders, says INBio director Rodrigo Gamez. "And not

only does it give Costa Rica another crop, another industry," he adds, "it also makes bananas more profitable and more environmentally sound." The contract with BTG could represent the first time in history that royalties were paid to a country for the intellectual property found in its living endowment.

INBio will devote half of any royalties to operating expenses and half to conservation areas. Thus, profits from Costa Rica's biodiversity may one day completely support the organization's search for nondestructive profits from native species and the habitat on which those species depend.

#### Carbon Storage

Many of Costa Rica's other conservation efforts have begun generating revenue from their inception. For instance, the country has received funding for a new national park from the U.S. National Fish and Wildlife Foundation, which seeks to preserve a migratory bird habitat. Costa Rica will also receive funds from Tenaska, Inc., an independent power producer in Omaha, Neb., to set aside 8,000 acres slated for deforestation as a new national park. The company has chosen the site to meet its contractual obligation with the Bonneville Power Authority to offset greenhouse gas emissions with conservation and "carbon storage." UNEP's Brown notes that Costa Rica is in "prime condition" to receive a great deal of other such assistance "because it has acted boldly and courageously in adopting the sustainable development plans."

Another foreign-funded project that will play a role in carbon storage is the National Bamboo Project, which is establishing several new plantations of bamboo as a low-cost, renewable replacement for wood and concrete in home construction. Bamboo grows faster than trees—some varieties can shoot up several feet in a single day—so the crop will alleviate pressure on natural forests. (See "Building with Bamboo," TR August/September 1994, page 17.) The Netherlands is donating nearly \$6 million to the project, which will grow 5,000 acres of bamboo for use in making furniture and construction.

Costa Rica itself is funding fossil fuel conservation by adopting one of the world's first "carbon taxes," a measure that failed to gain support in the United States. While two-thirds of the receipts from the 15 percent tax on oil and gasoline will be used to fund road construction, the rest will go "directly to small farmers to grow trees to soak up carbon," says Figueres, who notes that trees could also protect watersheds and provide pulp for making paper.

A new electricity tax, intended to reflect the true environmental cost of electric power and encourage conservation, will also fund tree planting around hydroelectric dam impoundments, which have been filling with silt washed down from bare hillsides. "We're going to add environmental costs into products and services," says



Costa Rica's planning minister Leonardo Garnier, "to internalize costs that are usually not seen, and to ensure that the polluter pays."

To further encourage conservation, Figueres signed the Rational Use of Energy Act last November. By 1996, all new appliances will bear labels detailing their energy consumption. Tax credits will go to buyers of efficient appliances and businesses that save energy. The strategy is supposed to shave two to four points off today's 9 percent annual increase in electricity demand. Beyond that, to help reach a goal of producing fully 98 percent of its electricity from renewable sources by the year 2000, Costa Rica is installing a second geothermal generator. When completed, the project will use the earth's heat to supply more than 25 percent of the nation's electricity.

The focus on energy conservation is not pure environmental altruism—it also reflects a serious energy shortage resulting from rising demand, low rainfall in the hydroelectric watershed, and the ris-

ing cost of fossil fuel imports. But this is how sustainable development is supposed to work: the energy program produces synergistic benefits in watershed improvement, balance of trade, and air pollution.



Wildlife sanctuaries including the Cabo Blanco Absolute Nature Reserve (top), which contains exotic species such as this magnificent giant strangler fig tree, will encompass 25 percent of Costa Rica's land area under the country's sustainable development plan. Daniel Janzen (above, middle), a biologist from the University of Pennsylvania who serves as an unpaid advisor to the National Institute of Biodiversity, has trained rural Costa Ricans to comb conservation areas and collect as many different species as they can find.

#### Finding the Middle Ground

Like any innovator, Figueres has had to act in the face of criticism, not the least of which relate to actions affecting Costa Rica's burgeoning tourist industry, which in 1994 generated revenues exceeding \$700 million. On one hand, Figueres rightly contends that his conservation strategy is a natural ally of tourism, since foreign visitors are generally more interested in birdwatching, snorkeling, fishing, whitewater rafting, jungle hiking, and observing volcanoes than in strolling through cattle pastures or banana plantations. Nevertheless, industry leaders have criticized Figueres's moves to raise gasoline and hotel taxes, saying they will make Costa Rica—already the priciest destination in Central America—20 to 30 percent more expensive. The industry has similar worries about a new \$15 entry fee for foreigners at national parks, which Figueres justifies as funding for desperately needed conservation efforts and park improvements.

Figueres also forced a controversial proposal for a "Cancun-style" resort development on the Pacific coast to undergo a substantial downsizing. A Mexican company had planned to build a marina, two 18-hole golf courses, and between 15,000 and 26,000

PHOTOS: DAVID TENENBAUM

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hotel rooms on 5,000 acres owned by the government in Guanacaste Province. While the previous administration had not objected to the plan, Figueres felt it was in direct violation of the concept of sustainability since the resort was too concentrated and would create too much pollution.

Similarly, Figueres ruled decisively when Stone Container Corp. wanted to build a mill for chipping logs and a port to ship them abroad in a pristine rainforest on the southern Pacific coast. Critics charged that the port would pollute Gulfo Dulce (the sweet gulf), which is at the heart of a relatively unscathed rainforest. The administration concurred and required that Stone build its facility else-

where. Even so, according to a spokesperson at Stone, "the government decreed that this was a very important project, and they helped us get permits, deal with local municipalities, and find the new site" in the town of Golfito, which had an existing port in a less sensitive area of Gulfo Dulce.

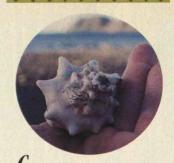
Figueres's decisions often place the government in a tricky spot, says John McPhaul, assistant editor of the *Tico Times*, an English-language newspaper in San José, Costa Rica's capital and largest city. When someone proposes an environmentally questionable project, it's "very difficult" for the government to tell that person that "this [ecosystem] is more important than feeding your family." Yet Figueres seems to find a middle ground that allows some new development without severe environmental cost, he says.

#### **Measuring Impact**

Aside from the goal of producing 98 percent of its electricity from renewable sources by the year 2000, Costa Rica has not set many numerical targets for its sustainable development program. This is in contrast to other nations that are pursing some form of sustainable development, such as the Netherlands, which "has targets for everything from composting of household waste to cutting production of acid rain precursors," says Brown of UNEP.

Still, some obvious indicators will eventually help Costa Rica assess its success or failure. Gross national product should rise, as should acreage of forests. At the same time, the economy's energy use, siltation of lakes and rivers, and threats to biodiversity, such as deforestation, reef destruction, and fishery depletion should fall.

In the meantime, Costa Rican society seems to be taking the environment more seriously these days, which at least must be seen as a philosophical victory. "When I got here 14 years ago, the future of the parks was very much in doubt: they were not really consolidated, and



Costa Rica's conservation techniques are already being emulated in the United States and Brazil.

many people questioned whether a small developing country could afford not to utilize its resources," says McPhaul. "That's changed. The parks have gained all sorts of protectors in the social and political system."

This public sentiment can be seen in the emergence of dozens of local environmental groups in the last decade, and in the surprising lack of opposition to the plan to set aside 25 percent of the national landscape for conservation areas, says McPhaul. "There's also a growing awareness of the effects of deforestation on water quality," he says. "We're already seeing communities taking charge at the grassroots level, protecting local watersheds."

Another measure of success may be the fact that the conservation techniques that Costa Rica has developed over the past 10 years are being emulated in other countries. For example, a group of Wisconsin botanists has sued the U.S. Forest Service to force it to combine logging sites in two National Forests so that large tracts elsewhere in the forest can age naturally. Bil Alverson, one of those botanists, says it was Janzen, building on his experience in Costa Rica, who "offered the first clear look" at how roads and clearcuts can harm forests by fragmenting them. The same argument applies in the conservation areas of Costa Rica and the national forests of Wisconsin, Alverson says.

Similarly, the emphasis on recruiting and training local residents at Guanacaste has echoes in Brazil's Amazon, where residents near the 11,000-square-kilometer Mamiraua Ecological Station are serving as park rangers and doing ecological research for a new management plan. And Indonesia, Mexico, the Philippines, and Kenya have established biodiversity agencies modeled after INBio. Thomas Eisner, a Cornell University biologist who specializes in the search for useful chemicals in nature, calls INBio "the central authority on how to get this started."

Even if Costa Rica is wildly successful, some contend that the country's advantages in biodiversity, tourism, democracy, and education will make its achievements difficult to emulate, given the more complex environmental and economic problems elsewhere. But UNEP's Brown says that such an argument gets it backward: "You should start with the easy countries first, because if you can't do sustainable development where it's easy, how can you do it where it's hard?"

Janzen agrees, saying that Costa Rica's role is to prove that sustainable development is possible in the first place, and he argues that history proves the virtue of starting small. "The Wright Brothers didn't try to fly to the moon," he argues. "But they did demonstrate that humans could fly. This is what Costa Rica gives us."

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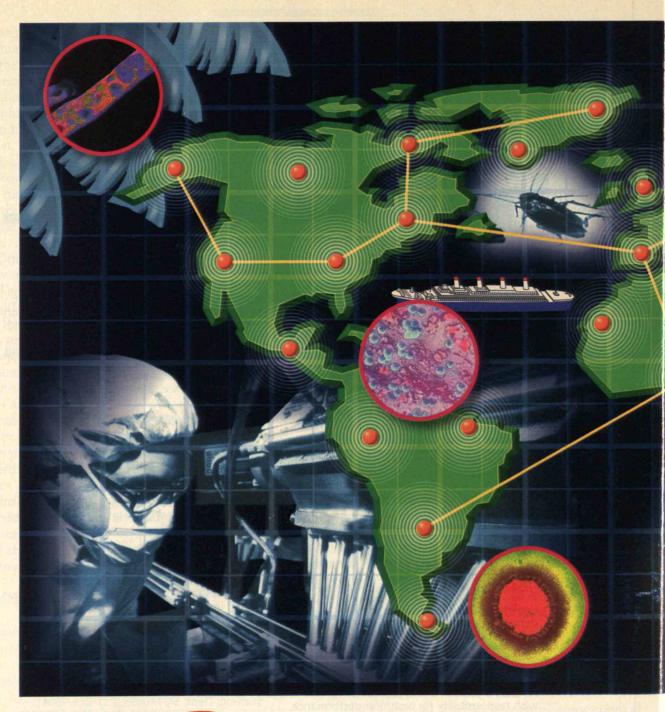
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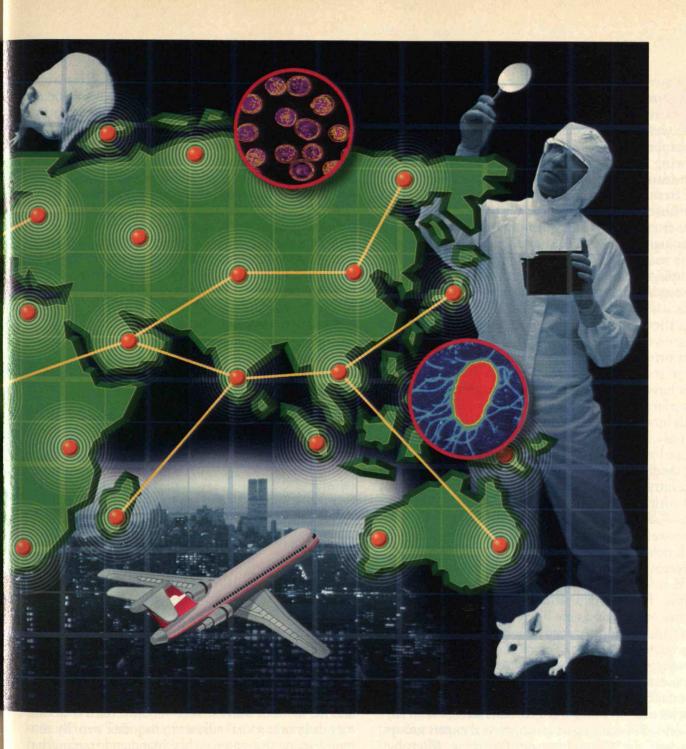
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# Ontrolling Infectious Diseases



The threat of emerging infections is great, but not insuperable.

Meeting it will require a system for surveillance and response that extends to every corner of the globe.

ILLUSTRATIONS
BY ROB SCHUSTER

ong believed to be all but conquered, infectious diseases have returned with a vengeance. They have included not only the recent deadly outbreak of Ebola in Africa and the worldwide AIDS epidemic but also Lyme disease, cholera, new strains of influenza, and hantavirus pulmonary syndrome, which causes death from respiratory failure in over half the people infected. Yet despite much talk about "new" diseases, most

are anything but. One category of worrisome microbes, including those that cause antibioticresistant tuberculosis, are just hardy strains of well-known bacteria: when antibiotics are used inappropriately, they kill only the weaker individuals, allowing hardy strains to flourish. And some of the most feared infections, like AIDS, derive from viruses that have simply moved into new areas or acquired new hosts. Many are zoonotic, meaning that they come from animals, and they often appear as a result of ecological changes. Frequently human activities are at the root—clearing forests or cultivating land, for example, can disturb the habitats of sequestered natural hosts such as mice and mosquitoes, increasing their contact with humans. As those activities have accelerated, the incidence of emerging zoonotic infections has grown with them.

Unfortunately, too, infections are more likely than ever to reach vast numbers of people. Historically, diseases have come as byproducts of exploration, trade, or warfare, when the movement of people, animals, or goods brought geographically isolated infections to new grounds. Rats carrying bubonic plague first entered Europe by the overland route from central Asia, through war, the silk trade, or both. Most historians believe the mosquitoes that carry yellow fever were spread from west Africa to the New World by ships plying the slave trade. Today, trucks and airplanes have largely replaced the slower-moving caravans and steamships, creating much richer opportunities for infections.

Moreover, economic conditions in many parts of the world are encouraging the mass movement of workers to cities. Thus infections that may once have remained obscure in rural areas are likely to reach large populations. And in industrialized countries, high-density settings such as daycare centers can allow diseases to spread rapidly once they have gained a foothold.

These are global problems transcending political and national boundaries. An infection may come to light anywhere in the world and span continents within days or weeks. Recognizing as much, several expert groups, including the Committee on Emerging Microbial Threats to Health at the Institute of Medicine of the National Academy of Sciences, have concluded that a surveillance system to spot emerging infections—an "early warning system"—is an essential first line of defense. But so far we aren't even close to having such a system. In 1993, with sponsorship from the Federation of American Scientists, ProMED—the International

STEPHEN S. MORSE, assistant professor of virology at Rockefeller University, was principal organizer and chair of the 1989 Conference on Emerging Viruses convened by the National Institutes of Health. He has also served on the Institute of Medicine's Committee on Emerging Microbial Threats to Health and chaired its task force on viruses. Currently he is chair of ProMED, the International Program for Monitoring Emerging Diseases.

Program for Monitoring Emerging Diseases—was launched, and in September of that year, the organization, along with the World Health Organization (WHO), convened 60 public health experts from around the world. They unanimously agreed that capabilities for surveillance of infectious diseases, at both the national and international level, were dangerously inadequate and greatly in need of strengthening.

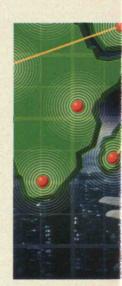
To be sure, some steps have been taken. Several national governments and some major U.S. agencies including the Centers for Disease Control and Prevention (CDC) and the National Institutes of Health (NIH) have joined with WHO to begin formulating international action plans. In May 1995 the World Health Assembly, the governing body of WHO, approved a

resolution to make surveillance of emerging and re-emerging infections a priority. Proposals now on the drawing board at WHO will streamline surveillance efforts and provide for a coordinating group. All these initiatives are excellent and deserve enthusiastic support. But because they will require resources, political will, and sustained commitment, achieving their goals will be a challenge.

#### The Problem of Fragmentation

An early warning system requires three elements at the front line. Recognition of "new" clinical syndromes is the first: there has to be a way to identify patients with such syndromes and gain access to them

for further studies. The second requirement is resources for epidemiologic field investigation—the medical detective work that helps determine the source of infection and the mode of transmission—and the third is laboratory diagnosis, a vital adjunct to the other two. By running tests on the materials like blood and sputum that clinicians take from patients, labs help differentiate new infections from common ones and estimate their extent and frequency; by running tests on potentially infected materials collected in the field, labs are also key in determining the source of infection and the mode of transmission. Depending on what is found, the next step may be immediate action to limit the spread of infection, perhaps through controlling mosquitoes or rodents, protecting the water supply, or administering immunizations or anti-microbial agents. But one of the main problems right now is that this stage is often not even reached because of deficiencies in the surveillance system. The clinical, epidemiological, and laboratory com-



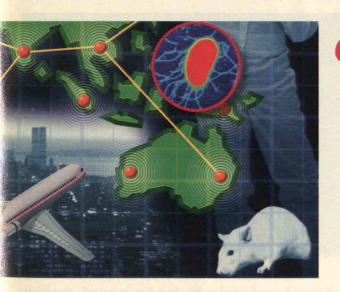
ponents need to be much more well integrated, and in particular epidemiological expertise and laboratory resources are seriously lacking.

Even so, the concerted efforts of the people and agencies in the system have provided enough examples of good ad hoc responses to outbreaks to prove that we need not be defenseless before an onslaught of infectious disease. For instance, consider the outbreak of hantavirus pulmonary syndrome in the summer of 1993. Beginning in May, patients were admitted to hospitals in New Mexico, Arizona, and Colorado with fever and acute respiratory distress; more than half died. By mid-August, there would be 23 cases in the three states. But there could have been many more: the public health system had happened to work well in this situation.

The first stroke of luck was that the outbreak was

prit, attention immediately turned to trapping local rodents for further laboratory testing. Researchers soon succeeded in identifying the host—the common deer mouse—and plans for controlling rodents and teaching local residents how to avoid contact with them got under way.

One reason the current system seldom works this well is that responsibilities are too broadly diffused. The task of disease surveillance and control in the United States rests with each state, and the attention given to it therefore varies according to local needs and resources. As the main federal agency for epidemiology and disease prevention, CDC maintains liaison officers in many state health departments and is available on request to help identify, investigate, or confirm cases, but these actions must be initiated at the state level. Even the list



e have enough examples of good ad hoc responses to outbreaks to prove that we need not be defenseless in the face of infectious disease.

spotted fairly early in its course: an alert clinician in New Mexico noted that two of his patients seemed to be stricken with the same inexplicable disease, and a follow-up on his observation led to identifying several other cases. This prompted him to contact the state health department, which also responded swiftly. When investigations confirmed that there was indeed a cluster of unusual disease, officials requested assistance from CDC.

Any outbreak with a high rate of mortality is taken with the utmost seriousness, and CDC mounted what it called a "full-court press," mustering all available resources to send a team to the Southwest rather than the usual lone epidemiologist. Meanwhile, a growing group provided laboratory support back in Atlanta at CDC headquarters, receiving materials from the team and testing them for a wide variety of infectious agents. When the tests suggested that a previously unrecognized hantavirus, a type of rodent infection, was the cul-

of diseases that must be reported to the state health department by physicians and local officials is determined by an organization of state public health officers; although nationwide consensus exists on most of the diseases, there are some variations from state to state, and it is hard to make additions to the list.

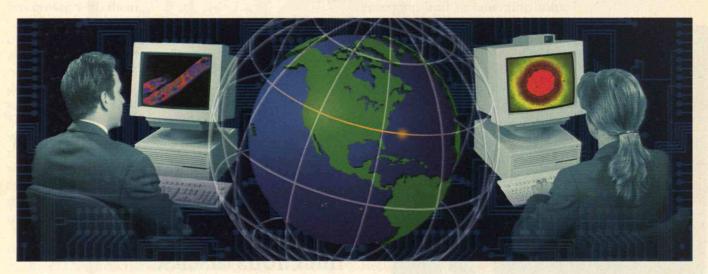
Under these conditions, infections are often identified as much by luck as by intention. For instance, an outbreak of hemolytic uremic syndrome, an illness characterized by bloody diarrhea and serious kidney disease and caused by a strain of *Escherichia coli* bacteria in hamburger meat, was missed in Nevada, and probably other states, before it was identified in 1993 by Washington state public health officials. No wonder that in 1994, when CDC set goals for the fight against emerging infections, it included strengthening the public health infrastructure not only at the federal level but also at the local and state level. No wonder, too, that meeting this goal was cited as key to meeting other goals,

such as improving surveillance and control programs.

On the global level the situation is the same writ large. WHO, the world's public health agency, is in a similar position internationally to CDC domestically, responsible for collecting information and coordinating activities. In other words, the organization is dependent on the cooperation and support of its member countries, whose health budgets are often limited. To make matters worse, funds for infectious-disease surveillance at WHO itself are limited—the agency has no money to carry out new initiatives. And WHO is fragmented, with several different units responsible for different kinds of surveillance data. For example, a number of important infectious diseases are foodborne and waterborne, but authority for these lies with separate offices within WHO.

would receive surveillance information from around the world, coordinate the work and reporting of the individual centers, and organize an appropriate response to emergency situations.

Some components of such a system are already in place, and indeed, it seems logical, as WHO has suggested, to begin by strengthening and better coordinating existing resources. WHO itself might serve as the central hub of the system, tracking both human and zoonotic diseases, the latter in partnership with the International Office of Epizootics, which currently handles outbreaks of diseases among animals. Prominent among the other resources at hand is the network of WHO Arboviruses and Hemorrhagic Fevers Collaborating Centers, which have specialized in unusual infections (arboviruses, transmitted by mosquitoes and other



#### **Building on What Works**

An international system that would respond to novel infections worldwide as effectively as CDC responded to hantavirus pulmonary syndrome in New Mexico is not at all impossible to imagine. One could be organized through local or regional centers, each of which integrates clinical, epidemiological, and laboratory expertise. Such centers would work with national governments to develop local surveillance networks consisting of area hospitals and health workers trained to detect unusual and dangerous clinical syndromes, and they would strengthen these networks by building a broad base of support within the region. Toward that end, they would forge good working relationships with public health authorities and medical schools to tap specialized expertise when needed, and cooperate closely with government agencies, volunteer groups, and other organizations committed to safeguarding public health. The networks would also have access to a back-up system of more comprehensive laboratories. A central hub

arthropods, are responsible for diseases such as yellow fever and dengue, and hemorrhagic fevers are those like Ebola that involve massive bleeding). But beyond that, we actually know very little about what we have to work with, so the next step would be to conduct a more comprehensive inventory and assessment of resources worldwide.

Once this has been accomplished, we could designate from among the existing facilities the dozen or so regional centers that would bring together clinical, epidemiological, and laboratory expertise. These centers would be looking for clusters of unexpected and unexplained death. To prevent their mission from becoming too diffuse, they could concentrate at first on a small number of key syndromes characteristic of some particularly serious emerging infections, like severe or fatal acute respiratory disease and severe acute neurological disease. Such syndromes are especially worth noting in adults, who can be assumed to have developed immunity to their more common causes. Antibiotic-resistant bacteria would be a priority as well.

After this skeletal network is functioning, WHO, in conjunction with the governments of its member countries, should expand it to include other types of diseases. The geographic base should be broadened as well, which would require identifying additional facilities that already meet some of the necessary criteria and could readily be upgraded. Priority should be given to facilities in areas of high biodiversity undergoing major ecological or demographic changes. After all, since many emerging infections are zoonotic in origin—and since they often arise when natural habitats are disrupted and spread when people move from one place to another—such areas are likely to be hot spots. The Ebola virus and quite possibly HIV originated in Africa, one of the most biologically diverse places on the planet.

D.A. Henderson, who spearheaded the successful

just a few instants. And in the near future, technologies such as electronic mail will play a crucial role, allowing for an almost immediate international response to health emergencies. ProMED has already established an Internet-based e-mail conference system to encourage discussion of emerging diseases worldwide. Anyone can subscribe by sending an e-mail message to majordomo@usa.healthnet.org and writing "subscribe promed" in the body of the message, and subscribers can gain access to past messages by e-mailing a request to the ProMED archive. The ProMED e-mail network also directs subscribers to other valuable resources on the Internet, such as an infectious-disease database administered by CDC and a bulletin-board system from the Canadian government.

The ProMED network, operated in conjunction with

ince emerging infections often arise when natural habitats are disrupted, one sensible action might be to include health surveillance in plans for major construction projects in areas of high biodiversity.

smallpox eradication program at WHO, recommended "look out" centers in the expanding urban areas on the periphery of tropical cities. Important port cities and other major places of high population density and flux should also be targeted. Another sensible action would be to include health surveillance in the plans for major projects such as irrigation, road building, and land clearance, especially in areas of high biodiversity. In the longer run, broader surveillance of ecological changes that might presage an increase in natural hosts for disease could also be considered.

Once in place, an early warning system for emerging infections would need good communications. As anyone who has tried to make a phone call in an emergency will attest, the importance of communications cannot be overemphasized. Fortunately, however, the technologies to establish good communications exist; the problem is chiefly one of ensuring that all the people who need them have access to them and know how to work them and who to contact. Fax machines have proved invaluable, delivering vital documents across the miles in

SatelLife, a nonprofit organization, now links health workers, veterinarians, and agricultural specialists in the industrialized world with their counterparts in Africa, Asia, Latin America, and the Middle East. Subscribers have discussed a range of problems, among them an outbreak of avian influenza in Mexico, a newly identified virus that apparently killed several race horses and their trainer in Australia, and the possibility that dangerous infections could emerge through the growing trade in ape meat and the practice of transplanting animal organs into humans. In April 1995, the ProMED conference carried the first report of Japanese encephalitis in Australia.

Another computer innovation of note is WHONET, software developed by physician Thomas O'Brien's group at Brigham and Women's Hospital in Boston. WHONET has been designed for dealing with antibiotic-resistant bacteria. Such pathogens can often be identified without much difficulty even in small hospitals with relatively unsophisticated laboratories; the challenge is not so much diag-

nosis as information gathering to spot trends. The sooner clinicians and public health officials can be advised of a resistant strain of bacteria, the sooner they can start working on a strategy to contain it.

With that in mind, O'Brien's group made the heart of WHONET a program that can be used on a small desktop computer in a microbiology laboratory to both handle recordkeeping and tabulate the results from routine tests of bacterial sensitivity to antibiotics. Participating labs agree to compile and send information periodically to a centralized facility for trend-spotting analysis.

Improved laboratory diagnosis is crucial, too, and here biotechnology researchers have helped by develthat opportunities are limited. People are unlikely to enter any field if they suspect that no job will be waiting for them. A career path must therefore be assured, which is an important reason why the proposed system needs to be established. Training might occur through supervised field work and perhaps personnel exchanges between different facilities in the system.

Lack of qualified personnel is perhaps most serious in the area of field epidemiology. Experts are few and largely of advanced age, raising the question of how effectively their know-how will be transmitted to future generations. And the fact is that field epidemiology is essential. Clearly, if the source of an infection and the

n the fight against infectious disease, there is no substitute for skilled, dedicated people, and today those people are in short supply.

oping efficient new methods, although the resources to make effective use of those methods are often lacking. For example, diagnosing viral infections can be tricky, but in the case of those viruses that have been identified, it can be routine now, thanks to advances such as ELISA, or "enzyme-linked immunosorbent assay." In these tests, material such as blood from a person who might be infected is typically exposed to components of a virus or other infecting agent to see if the body has manufactured proteins called antibodies to combat that agent. If the body has indeed manufactured the proteins, the person is determined to have been infected. Also, polymerase chain reaction technology (PCR), which allows large quantities of DNA to be synthesized from a single molecule, detects viruses with exquisite sensitivity. Not only are tests like ELISA and PCR rapid and reliable; they can be made widely available as well, since the needed compounds can frequently be supplied in quantity and in a stable, standardized form.

#### The Long Haul

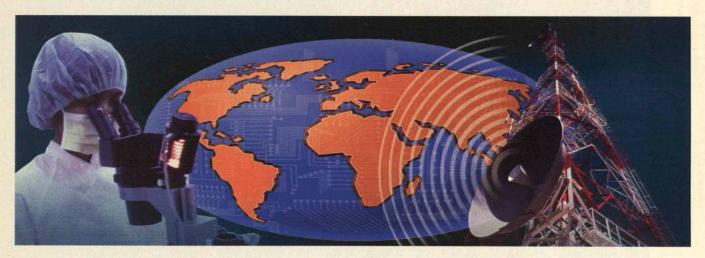
But while such technologies offer a great deal of hope, there is no substitute for skilled, dedicated people, and today those people are in short supply. One difficulty is mode of transmission remain unknown, the information traversing even the most extensive early warning system will be severely limited. Moreover, the immediate response to any outbreak, as well as the control programs to follow, would need to build on the data and contacts amassed during the investigative phase.

In the United States, the traditional mechanism for training people in epidemiological investigation is the CDC's Epidemic Intelligence Service (EIS), which has worked well. As part of their on-the-job training, EIS officers provide liaison services with state health departments or are sent out on field investigations. CDC has also developed an international version, the Field Epidemiology Training Programs, but while this is a good model, only about a half-dozen countries have programs now, and funds and personnel for expansion are limited.

Besides setting up an early warning system, a long-term strategy to counter emerging infections would mean taking a critical look at the ways we address the issues of prevention and control and developing a response system to improve on the current ad hoc approach. An effective response system would include advance plans for a range of contingencies, and would be integrated with the surveillance system, activated by the infor-

mation that surveillance supplies and using many of the same lines of communication. Indeed, surveillance and response might be seen as two halves of the same process. And just as strengthening the surveillance system will require streamlining and coordinating available resources, so, too, will strengthening the response system.

Another clear need is better methods of health education—for example, because antibiotic-resistant bacteria evolve through improper administration of antibiotics, education of antibiotic prescribers and users is critical. With other problems, better understanding of how to motivate health-promoting behavior such as safer sex is more to the point. And that might be best But most important, the commitment, and the financing, must be sustained as the public health infrastructure grows larger, and that will certainly not be so cheap. Also, the few countries in which a large public health infrastructure has already been established will require more resources early on, as their job will be to maintain and improve those systems. The United States, in particular, needs substantial backing if we are to bring our infrastructure up to the levels we expect. As a start, a working group on emerging and re-emerging infectious diseases set up by the Committee on International Science, Engineering, and Technology of the National Science and Technology Council has made some excel-



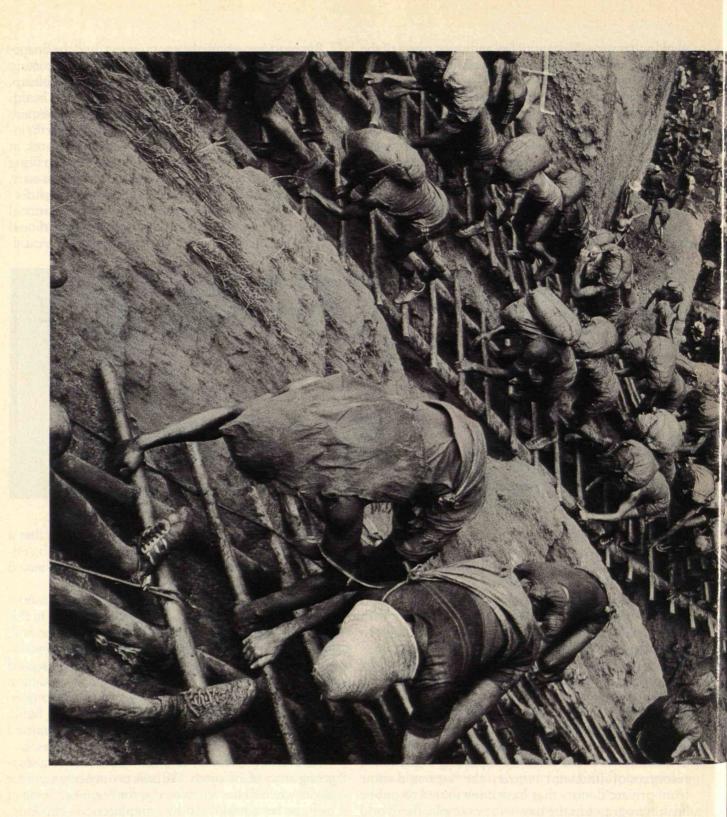
accomplished by extending the public health infrastructure to draw on research in the social sciences, which might also help us understand migration patterns and other human factors that contribute to the spread of disease. Finally, continuing basic research on pathogens and immunology must be encouraged, along with research on potential zoonotic threats and on ways to quickly and inexpensively develop vaccines.

Since the public health infrastructure in most of the world is fairly rudimentary and thus unable to absorb large investments anyway, the initial costs of implementing the international components of an early warning and response system for infectious diseases could be modest—as little as \$10 or 20 million a year. Many of those funds could come from pooling together the resources of different countries; the rest could come from private donors that have contributed to public health programs in the past—for example, the World Bank, development agencies, and major foundations. The money would finance upgraded resources at a dozen or so locations, supplying computers, software, and telephone or satellite links to ensure reliable data gathering and communications. It would provide for some personnel training, annual meetings of consortium members, and a small central staff as well.

lent recommendations. Among them is the idea that a number of U.S. government agencies could each contribute a small portion of their funds to a coordinated effort carried out by an interagency task force.

Granted, developing the political will to follow through on such initiatives is especially difficult in this age of shrinking resources and multiple demands. Still, history shows that failing to respond to infectious diseases carries a heavy price. Who could have imagined the enormous savings to be realized if HIV had been found and stopped early? In 1993, the World Development Report, the annual report of the World Bank, noted that in the previous year alone, industrialized countries paid \$4.7 billion to care for AIDS patients.

As of now, humanity remains vulnerable to a staggering array of infections. We have no unified system for global surveillance, let alone one for response. Some of us have been paralyzed by complacency—thinking, wrongly, that the threat of infectious diseases is past. Others have been equally paralyzed by defeatism, perhaps feeling that it is too difficult to build the systems needed to protect us. But even imperfect systems are better than none at all—and given today's urgent needs and the even greater needs we are likely to face in the future, there is more harm in delay.



A Tribute to the World's W



A photographer captures the humanity of people working, in industries ancient and modern, using methods primitive and sophisticated.



sebastião Salgado has been photographing the social and economic conditions of people in Europe, Africa, Asia, and South America for 20 years. Perhaps the world's most influential living documentary photographer, the 51-year-old Salgado, a Brazilian native who trained at the University of Paris as an economist, first began using the camera simply as part of his economic studies.

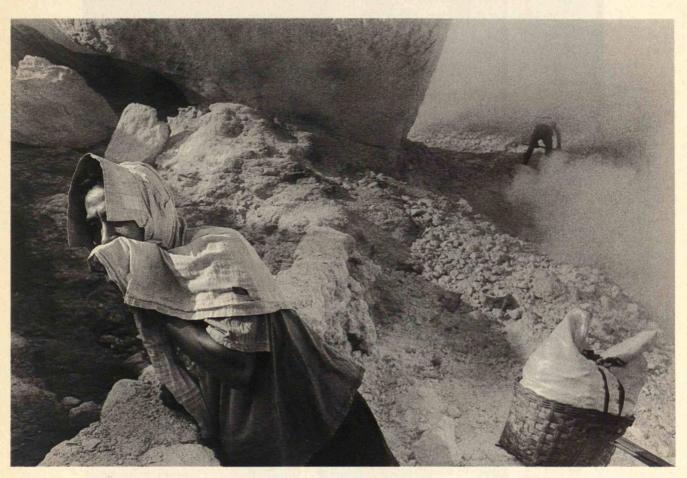
In "Workers," his most recently completed project, Salgado repeatedly confronts viewers with images depicting a range of technologies. As he says in the prologue of the accompanying catalog of the same name (Aperture, 1993), he is out to construct an "homage to workers, a farewell to a world of manual labor that is slowly disappearing" as the postindustrial era governed by computers rises to the fore. The project, which has been touring the world in exhibitions since 1993 (it will return to the United States in 1996), consists of photographs of people pursuing "primitive" tasks such as digging, hauling, cutting, and fishing as well as activities like industrial manufacture and tunnel construction that rely on more advanced skills and crafts.



A

For example, Salgado illustrates the fact that in some countries agricultural production remains much as it has for a century. Such is the case in the harvesting of sugarcane in Cuba (A). Salgado also shows how mining of raw materials is often accomplished by simple technologies that rely on brutally dehumanizing labor: his photographs depict workers chiseling apart chunks of sulfur in Indonesia (B) and, as part of a human chain, carrying bags of earth at the Serra Pelada gold mine in Brazil (frontispiece).

MILES ORVELL, a professor of English and American studies at Temple University, has written extensively on the history of photography. He is the author of After the Machine: Visual Arts and the Erasing of Cultural Boundaries (University Press of Mississippi, October 1995), which includes a more extensive consideration of Sebastião Salgado's photography.



R

Images showing manual labor affiliated with more advanced technologies include shipbuilding in France (*C*). And although modern construction projects such as the boring of the English Channel tunnel are highly mechanized, they still require skilled people—for example, to work with the massive earth-cutting drills (*D*).

Then there are Salgado's photographs revealing how the Third World transforms leftover products of the First World. One remarkable

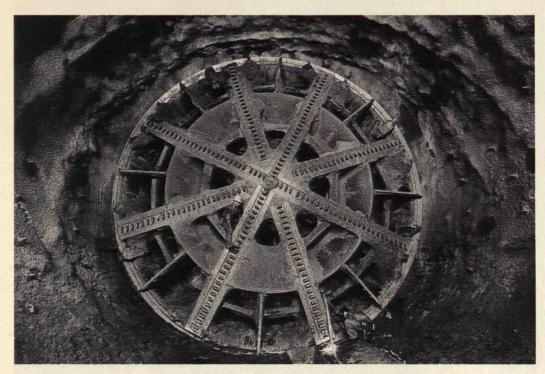


series shows Bangladeshis dismantling giant freight ships piece by piece using only simple tools (*E*).

By insisting that we respect the efforts of all these workers, Salgado confronts the Western tradition of markedly differentiating among classes of labor. "There is no work more or less important than other forms of work," he says in

an interview. Consider, for example, the labor of the Cuban sugarcane cutter. "This person is there in your coffee in the morning," points out Salgado. His images, which make vivid such otherwise invisible components of our collective economic and social lives, also make obvious the nature of a global economy in which the Third World works to satisfy the markets of developed countries.

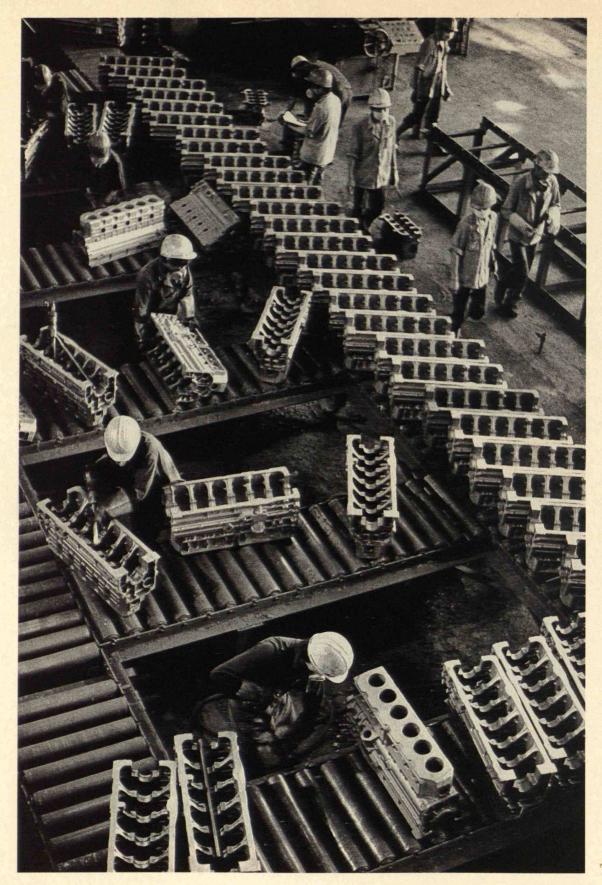
Along with addressing economic imbalances in the world, Salgado presents work situations he finds reasonable. A photograph of workers and the engines they are producing in a factory in China (*F*, page 68) gives a sense of balance between people and machines. "The final product" in such arrangements, he writes in the catalog, "is the result of each employee working in sequence and communion, the fruit of social labor." In the Lada car factories of Russia, moreover, he shows workers







F



F

enjoying restful breaks and birthday celebrations (G, H).

But does the industrial era represent a valid ideal, given the tiring, repetitive work, the noxious fumes, the commonly intense production pressures, all of which might escape the camera's frozen moment of

reality? Although Salgado charges, in the case of the modern auto industry, that relationships among people are "vanishing with the arrival of intelligent machines," isn't advanced industrial technology creating jobs as well as eliminating them?

Salgado acknowledges that through his camera he cannot provide much of a solution to the complex problems raised by today's global economy. Instead, he says, his charge is to help initiate an examination of the nature of work today, which could lead to debates about its proper future. Salgado writes that he partly views history "as a testament to man's ability to survive" conditions such as oppressive work. His images make us ponder not only how to survive our world but how to change it.

That's the same response he is striv-

ing to obtain with the project he's been pulling together since finishing "Workers." In an effort Salgado is calling "The Recomposition of the Human Family," he is now focusing his camera on the geographic and cultural dislocations resulting from political and economic upheaval in such places as the former Yugoslavia and parts of Africa. In a way, such disruption has always been his subject: what communities face as they undergo the grinding pressures of historical change.





## THE HUMANE ENGINEER SAMUEL C. FLORMAN

# The Quest for Comfort

am grateful for my pillow. Yes, my pillow, that commonplace object upon which I rest my head through the night. It is made of a spongy plastic that provides just the right combination of support and pliability. I have experimented with many pillows and chosen the one that suits me best. I do not take it for granted, this manufactured article that gives me so much comfort. A lot of people worked hard and ingeniously over many years to create it. I relish my sheets and blankets, too, along with the mattresses and box springs. What marvels of linen growing, wool shearing, fiber making, weaving, manufacture and transport have been accomplished for my benefit! Some mornings, as I open my eyes-warm, safe, at ease-I am suffused with gratitude for human creativity and enterprise, with reverence for the achievements of technologists.

Technology begins with the quest for comfort, which consists mainly of those feelings that go with being fed and protected. Our species, like all others, has been formed by the exigencies of evolution. We seek comfort largely through technical activity, by making things that keep us warm, dry, nourished, and safe. In their lust for life—and their consequent quest for comfort—our forebears became amazingly clever, dexterous, intelligent, and inventive. "Technology" is a bleak word, associated in the public mind with smokestacks, dynamos, electronic devices, and parking lots. It deserves a better fate, symbolizing as it does so many of the splendors of the human spirit.

Of course, the thought of too much comfort makes us uneasy. This stems from a cautionary lesson taught by evolution and embellished by philosophy. The hardiness of primitive hunters and warriors is part of our nature. We espouse Spartan virtues—valuing the rigors of exercise and disdaining excesses of luxury. Nevertheless, the claims of comfort are many and elemental, as are our ties to the technology by which we try to achieve it. If it is sinful to worship comfort, it is equally sinful to take it for

granted, and to fail to appreciate the ingenuity and effort by which it is achieved.

Further, it is wrong to ignore the poverty and destitution that characterize the lives of so many of our fellow humans, and to neglect the skill and effort that is the only means of mitigating so much misery. What could be a more noble goal than to secure a modicum of comfort for the uncounted masses whose daily lot is suffering?

Fond as I am of my pillow, I am perhaps even more fond of my electric alarm clock. It is so complex and yet so simple. In summoning me to a new day, it speaks to me of energy and purpose, of missions and objectives. There are sages, I know, who deplore the awareness of time that is so much the mark of our modern age. Lewis Mumford, for example, regretted that with the coming of time-keeping, "Eternity ceased gradually

types, including a clock-radio, but eventually settled on a plain, low-slung model that wakes me with an agreeable dinging sound and displays the time with red glowing numbers that I can read in the dark without my glasses. The numbers speak to me in a universal language, denoting quantity and proportion, or kindling thoughts of other people and locales. When it is 3 a.m. in New York, it is just midnight in California, and mid-afternoon in China; sometimes I wonder what is happening in those remote places while I turn over and puff up that wonderful pillow.

My mornings do not typically begin with an ode to technology. As with most people, personal concerns prevail over cosmic reflections. Nor do my primary concerns relate to comfort and the devices that affect it. Along with Walt Whitman, I give thanks "for health, the midday sun, the impalpable air—for life,



to serve as the measure and focus of human actions." He concluded dourly that the clock "is the key-machine of the modern industrial age." Perhaps he is right, but if so I find no cause for lamentation. I am a product of the modern industrial age. Technology is my birthright, and I revel in it.

As a boy, I had a classic round Westclox with a bell on top. I enjoyed winding it every day and thinking about the complex mechanism that made it go. But the alarm was loud and jarring, and occasionally the ticking could be an annoyance. I switched to an electric timekeeper when they became inexpensive. Through the years I tried various mere life." And I agree with Walter Scott's minstrel that "love is heaven and heaven is love."

But on some days—some special days—an awareness of my pillow, or my alarm clock, or some other manufactured object, will start me thinking about the wonders of technology. The poets fail to do justice to God's world when they ignore, or even undervalue, the handicraft impulse that has evolved into engineering.

SAMUEL C. FLORMAN, a civil engineer, is the author of Engineering and the Liberal Arts, The Existential Pleasures of Engineering, Blaming Technology, and The Civilized Engineer.

70 OCTOBER 1995

PHOTOS: L. BARRY HETHERINGTON

## THE ECONOMIC PERSPECTIVE BENNETT HARRISON

# Why Business Alone Won't Fix the Cities

HE word that Harvard Business School professor Michael Porter was turning his attention to the problems of the inner city generated excitement among people who care about urban economic development. Porter's earlier writing on industrial competitiveness, and his synthesis of evidence showing how myopic U.S. business is in its investment planning, have become foundation stones of the movement to keep government engaged in industrial and technology policy. Porter has recently been trying to find out how urban businesses—especially those that are minority-owned—might more strategically identify and exploit their often overlooked competitive advantages.

Porter's analyses of industrial competitiveness were dead on. But this time, the guru has it only half right—and because of his prominence and influence,

that's not good enough.

The key to developing inner cities, Porter contends, lies in exploiting linkages within and among clusters of businesses. He notes the great benefit that ought to accrue to areas blessed with high population densities and proximity to a rich mix of companies. And he sees the inner city as home to substantial actual and latent entrepreneurial talent. Where he goes wrong is in his insistence that these developments can and—if only government and community groups get out of the way—will be pursued vigorously by the private sector.

Writing in the *Harvard Business Review*, Porter maintains that local governments and community-based organizations impose burdensome regulations on business, stir up neighborhood resentment of "outsiders," and channel scarce resources into unproductive social programs that do nothing to promote the accumulation of wealth. Instead, he says, governments can boost development in inner cities by providing subsidies to mainstream companies.

A look at the real world belies this analysis. One of Porter's favorite examples is MetroTech, an 18-acre "campus" for Wall Street back-office operations, recently built in Brooklyn. The complex

already supports thousands of jobs. But it was the city of New York that enlisted the private sector in creating Metro-Tech—not the reverse. The city's economic development department did the planning, assembled the parcels of land, re-opened a subway station, and provided substantial tax incentives to convince brokerages not to move to New Jersey. Local officials around the country have initiated similar projects in a burst of local creativity that both Democrats and Republicans point to in justifying efforts to "devolve" federal functions to the states and cities.

Indeed, clusters or no clusters, the business community cannot by itself earn enough short-run profit to justify major investments in low-income urban districts, and in the absence of government initiative, little will happen. Consider Boston's Longwood medical area, a concentration of world-class health

Nor does the alleged antibusiness attitude of the inner city's community-based organizations stand up to scrutiny. According to surveys by the Community Development Research Center at the New School for Social Research and the National Congress for Community Economic Development, some 2,500 community development corporations across the country build retail and industrial space, own and operate businesses, provide millions of dollars in venture capital, and have become the principal vehicle for bringing private industry—especially banks—into inner cities.

Porter draws a sharp—and false—distinction between economic and "social" policies. Businesses need steady customers and reliable employees. People who are ill-housed, ill-fed, or just plain ill can't be either. Thus, programs that produce affordable housing, distribute food stamps, and staff and equip health



care facilities located near the city's mostly black and Latino neighborhoods. Today, activities such as laundry services, building maintenance, and just-in-time delivery of supplies are performed in-house or by suburban vendors. But such services could easily be provided by minority-owned firms located nearby. Although proposed many times before, this shot in the arm has not happened—owing in large part to an absence of pressure from the local government. While city halls in Pittsburgh and elsewhere have successfully brokered connections between inner city neighborhoods and hospitals, Boston has yet to try.

clinics materially contribute to the local business climate.

I fear that Porter's latest work will raise expectations about private-sector white knights that cannot possibly be fulfilled. In a time of growing cynicism and anger—especially among inner city youth—the nation cannot risk still another round of bitter disappointment based on false advertising.

BENNETT HARRISON is visiting professor of political economy at Harvard's Kennedy School of Government. His latest book, published last January by the Ford Foundation, is Building Bridges: Community Development Corporations and the World of Employment Training.

FORUM HERBERT I. GANS

Fitting the Poor into the Economy

THE notion of the poor as too lazy or morally deficient to deserve assistance seems to be indestructible. Public policies limit poor people to substandard services and incomes below the subsistence level, and Congress and state legislatures are tightening up even on these miserly allocations—holding those in the "underclass" responsible for their own sorry state. Indeed, labeling the poor as undeserving has lately become politically useful as a justification for the effort to eliminate much of the antipoverty safety net and permit tax cuts for the affluent people who do most of the voting.

Such misplaced blame offers mainstream society a convenient evasion of its own responsibility. Blaming poor men and women for not working, for example, takes the onus off both private enterprise and government for failing to supply employment. It is easier to charge poor unmarried mothers with lacking family values than to make sure that there are jobs for them and for the young men who are not marriageable because they are unable to support families. Indeed, the poor make excellent scapegoats for a range of social problems, such as street crime and drug and alcohol addiction. Never mind the reversal of cause and effect that underlies this point of view-for centuries crime, alcoholism, and single motherhood have risen whenever there has not been enough work and income to go around.

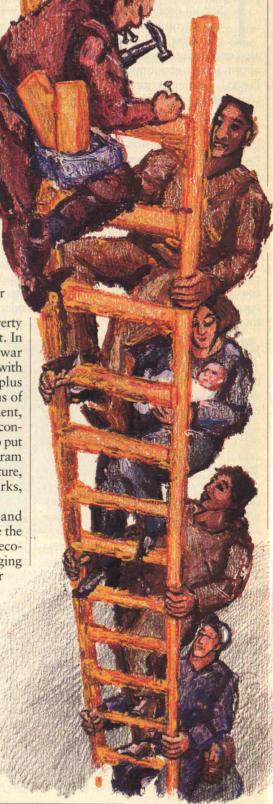
The undeserving underclass is also a useful notion for employers as the economy appears to be entering a period of long-term stagnation. Jobs are disappearing—some displaced by labor-saving technologies, others exported to newly industrializing, low-wage countries, others lost as companies "downsize" to face tougher global competition. Indeed, the true rate of unemployment which includes involuntary part-time workers and long-term "discouraged" workers who have dropped out of the job market altogether—has remained in double digits for more than a generation and no longer seems to drop during times of economic strength. Labeling Present policies blame broad social maladies on those who are most burt by them: the boor. Rather than inventing an unfit underclass, society should ensure that no one falls through the economy's cracks.

poor people as lacking the needed work ethic is a politically simple way of shedding them from a labor market that will most likely never

need them again.

The most efficient antidote to poverty is not welfare but full employment. In the short run, therefore, today's war against the poor should be replaced with efforts to create jobs for now-surplus workers. New Deal-style programs of large-scale governmental employment, for example, can jump-start a slow economy. Besides being the fastest way to put people to work, a public-works program can improve the country's infrastructure, including highways, buildings, parks, and computer databases.

In addition, private enterprise and government should aim to stimulate the most promising labor-intensive economic activities and stop encouraging new technology that will further destroy jobs-reviving, for example, the practice of making cars and appliances partly by hand. A parallel policy would tax companies for their use of labor-saving technology; the revenues from this tax would pay for alternative jobs for people in occupations that technology renders obsolete. This idea makes good business as well as social sense: human workers are needed as customers for



the goods that machines now produce.

To distribute the jobs that do exist among more people, employers could shorten the work day, week, or year. Several large manufacturing companies in Western Europe already use worksharing to create a 35-hour week. Making significant inroads on U.S. joblessness may require reducing the work week to 30 hours.

#### Finding Solutions, Not Scapegoats

A more generous welfare system would go a long way toward solving the problems of the remainder: those who cannot work or cannot find jobs. By persisting in the belief that poor people deserve their fate, society can easily justify a paltry and demeaning welfare system that pays recipients only about one-quarter of the median income. A system that paid closer to half the median income, by contrast, would enable those without work to remain full members of society and thus minimize the despair, anger, and various illnesses, as well as premature mortality, distinctive to the poor.

For such antipoverty policies to gain acceptance, mainstream America will have to unlearn the stereotype of poor people as immoral. Most of the poor are just as law-abiding as everyone else. (While a minority of poor people cheat on their welfare applications, an even larger minority of affluent people cheat on their tax returns—yet the notion of undeservingness is never applied to the middle or upper classes.) In admitting that the phenomena now explained as moral dereliction are actually traceable to poverty, Americans will force themselves to find solutions, not scapegoats, to the country's problems.

Most of the people assigned to today's undeserving underclass are the first victims of what is already being called the future "jobless economy." In the long run, if the cancer of joblessness spreads more widely among the population, large numbers of the present middle class will have to adapt to the reality that eventually most workers may no longer be employed full time. In that case, more

drastic job-creation policies will be needed, including a ban on additional job-destroying technology and the establishment of permanent public employment modeled on the kind now associated with military spending. Worksharing would most likely be based on a 24-hour week.

At that point, everyone would in fact be working part-time by today's standards, and new ways to maintain standards of living would have to be found. One approach, already being discussed in Europe, is a universal, subsistencelevel income grant. This "demogrant," a twenty-first-century version of the \$1,000-per-person allotment that presidential candidate George McGovern proposed in 1972, would be taxed away from people still working full time. In any case, private and government agencies should begin now to study what policies might be needed to preserve the American way of life when the full-time job will no longer be around to pay for the American Dream.

It is possible, of course, that new sources of economic growth will suddenly develop to revive the full employment and prosperity of the post-World War II decades, And some labor-saving technologies may, in the long run, create more jobs than they destroy; that may well be the case for computers, which have spawned a large sector of the economy. Such happy outcomes cannot be counted on to materialize, however, and there remains the danger that the war on the poor will continue as the politically most convenient path. We will undoubtedly find that when the economy begins to threaten the descendants of today's middle and even affluent classes with becoming poor, and then "undeserving," policies that today seem utopian will be demanded, and quickly.

HERBERT J. GANS is Robert S. Lynd professor of sociology at Columbia University and the author of many books on social policy. He has based this article on ideas from The War Against the Poor: The Underclass and Antipoverty Policy, just published by Basic Books.

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# Reviews

#### BOOKS

#### MYSTIFYING THE NET

Out of Control: The Rise of Neo-Biological Civilization by Kevin Kelly Addison-Wesley, \$28

#### BY MELANIE MITCHELL

OR most of its history, science was encompassed within the catch-all term of "natural philosophy"; the rise of scientific specialization, now seen clearly in the almost clean separation of university departments, did not begin until the seventeenth century or later. Interestingly, movements back toward a more unified or "interdisciplinary" approach have been gaining steam in recent decades.

As early as the 1940s, '50s, and '60s, the invention of the electronic computer-along with related developments, such as the formalization of "information"—gave rise to attempts to unify principles in diverse fields. And although much of the interdisciplinary fervor subsided in the 1970s and early '80s, a renaissance of enthusiasm is now under way. Computer scientists are finding that biology is a rich source of inspiration for building "adaptive" computer programs; like life forms, these programs gather information about their environment and automatically use it to improve their performance. At the same time, physicists, biologists, and neuroscientists are drawing on the theory of computation to understand information processing in natural systems, and economists are using biological evolution as a source of metaphors for how economic change and innovation take place.

This recent renaissance is spurred by some momentous possibilities, such as capturing evolution and creating life in computers, engineering biological organisms, and, perhaps most ambitious,



finding universal laws that govern all complex systems in nature. Such ideas have caught the fancy of the general public, as reflected in a proliferation of popular-audience books, including *Out of Control* by Kevin Kelly, editor of *Wired* magazine.

Kelly's book is a broad survey of current thinking on the merging of biology and technology. "The realm of the born-all that is nature-and the realm of the made—all that is humanly constructed—are becoming one," he writes. "Machines are becoming biological and the biological is becoming engineered." He ranges over the spectrum of what's hot in today's computer science and biology, jumping from bee hives to insect robots to artificial evolution. He covers electronic money, virtual reality, computer animation, the engineering of coral reefs, and Biosphere 2, the huge, complex glass-enclosed ecology in the desert of Arizona.

Along the way, he tells some wonderful stories, recounting, for example, the tale of how a crowd of 5,000 computergraphics experts gave themselves over to the kind of decentralized collective logic behind many of the most interesting new computer systems—they succeeded in controlling a complicated

flight simulator by individually "voting" on what to do at each moment. Another compelling part is the history of the Survival Research Labs, a San Franciscobased group of performance artists whose huge machines built out of found—or stolen—parts display distinctly life-like properties and engage in street-theater robotics.

These descriptions of cutting-edge research and high-tech art are the strongest parts of *Out of Control*—though Kelly occasionally lapses into hype, his excitement is contagious. Yet for technically minded readers the fun of reading will be mixed with frustration. The tantalizing ideas are covered rather superficially, with many intriguing science sound-bites but hardly ever enough detail to convey the science involved.

#### **Alluring Labels**

Then there are Kelly's own philosophical musings on biological machines and mechanical biology, which, to my mind, are the weakest parts of the book. These musings, in which Kelly dives head-first into some of the deepest of scientific questions, often end up sounding vague, mystical, and at the edge of intelligible. Aphorisms like "Every self is an argument trying to prove its identity," or "Biology is an inevitability—almost a mathematical certainty—that all complexity will drift towards," have an aura of depth but not much content. Kelly also holds some very fuzzy views of logic and causality. He creates a nice pun-"We now see that no logic except biologic can assemble a thinking device, or even a workable system of any magnitude"-but he takes it too seriously, asserting many times that the "swarm logic" of biological systems is somehow different from "ordinary logic," and that the "lateral" or "nonlinear" causality in such systems is somehow different from ordinary causality.

The result is a rather religious view of networks, parallelism, and the like. The "Net" is invoked as a mystical object: "The Net is an emblem of multiples. Out of it comes swarm being—dis-

tributed being—spreading the self over the entire web so that no part can say 'I am the I.' It is irredeemably social, unabashedly of many minds. It conveys the logic both of Computer and of Nature—which in turn convey a power beyond understanding." This phrasing makes the actual ideas Kelly is discussing sound more revolutionary than they really are, as becomes clear if we convey them in more pedestrian language. (Networks consist of many interconnected parts, over which information can be distributed. Networks can be used both for computation and for modeling natural systems. In general their behavior is difficult to analyze mathematically.)

In fact, Kelly's outlook strikes me as being, paradoxically, anti-scientific. Here, in a book that is trying to explain the science behind complex systems, he gives the impression that when lots of simple parts are highly interconnected, somehow, magically, phenomena such as "life" emerge. I deeply share Kelly's wonderment at decentralized collective behavior, but find it strange that the goal of science—to understand the *mechanisms* underlying such phenomena—is left out of his musings.

Some of the difficulty seems to lie in the power given to certain words such as "evolution." Kelly makes a great deal of "evolutionary computation," in which computer programs inspired by biological evolution evolve solutions to complex problems. In presenting evolution as the future of computation, he describes with great reverence several research projects that entail evolution by computers. However, it seems that Kelly is seduced as much by these words and their air of mystery as by the computer programs themselves.

Of course, if alluring labels stir up excitement in science and help cause biologists and computationalists to work together, they have served a worthy purpose. But as one who works in evolutionary computation and who believes strongly that biologically inspired approaches will indeed be the future of computation, I am

nonetheless worried about their facile appeal. In the field of artificial intelligence, extreme enthusiasm early on ("in 10 years we will have true thinking machines") gave way in some quarters to extreme disappointment and dismissal ("AI doesn't work at all"). Extremes of both sorts are unhealthy in science, and I am worried that the almost religious faith in evolution and other biological phenomena as the saviors of artificial intelligence will hinder real progress. The approaches Kelly celebrates are promising but not proven. Establishing exactly what they can do will take time and hard

Kelly ends the book on two strangely conflicting notes. The first is humility: he provides a list of excellent, difficult philosophical questions about the topics he has covered: "What, if anything, cannot be simulated?" he asks, for example, and "What, if any, are the distinctions between a simulation and a reality?" The second note is hubris (some might say chutzpah): Kelly enumerates the "Nine Laws of God," which purport to explain everything he has discussed. "These nine principles underpin the awesome workings of prairies, flamingoes, cedar forests, eveballs, natural selection in geological time, and the unfolding of a baby elephant from a tiny seed of elephant sperm and egg," he writes. A disquieting thought for scientists: has Kelly done all our work for us?

But not to worry. While his nine principles summarize some nice observations about complex systems in general, such as the tendency toward "control from the bottom up," they turn out to be the laws of a rather vague god, not the better-known deity who is "in the details" where most of science lies. Kelly's god has, I'm glad to say, left all the details in the world for scientists to figure out.

MELANIE MITCHELL is research professor and director of the Adaptive Computation Program at the Santa Fe Institute, where scientists from a range of disciplines meet to study complex systems.

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BOOKS

#### TOWARD REAL UNDERSTANDING OF TECHNOLOGY'S PAST

Future Imperfect: The Mixed Blessings of
Technology in America
by Howard P. Segal
University of Massachusetts Press, \$15.95 in paper

BY ALBERT H. TEICH

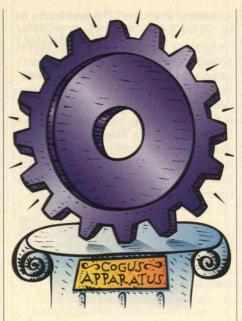
s the DuPont Co. claimed in its ads some years ago, we in the United States seek "better living through chemistry." Like General Electric of that era, we know that "progress is our most important product." We visit tourist meccas like the Museum of Science and Industry in Chicago and the National Air and Space Museum in Washington, where we stand in awe of technological achievements from coal mines to Saturn rockets. We tour theme parks like Florida's EPCOT Center and stroll amidst the technological visions of governments and multinational corporations.

In Future Imperfect: The Mixed Blessings of Technology in America, Howard P. Segal, professor of history and director of the Technology and Society Project at the University of Maine, attempts to draw together some 15 of his articles, book chapters, and reviews written between 1977 and 1990 into a multifaceted critical examination of the American ideology of technological progress. Assembling more than a dozen years of one's scholarly work into a coherent statement on a complex subject is an ambitious undertaking, and Segal is only partially successful. In style and tone as well as substance, the book is uneven and sometimes disjointed. Nevertheless, the author has important and provocative things to say. He points out, for instance, that although technological progress has not perfected our world, the issue for Americans is not how to do without technology but how to "live sanely and humanely" within our technological society.

He begins his search for the ways in which people have dealt with that issue by rethinking the "middle landscape" idea of MIT humanist and historian Leo Marx. In explaining this idea, Marx himself has focused on "the machine in the garden," which he uses as a cultural symbol for the intrusion of industrialization into an idealized, pastoral America. But Segal's opinion is that Americans do not assume such an antagonistic relationship between nature and technology. For him, therefore, the middle landscape is an image that captures the attempt to reconcile the two. And he suggests that rather than declining after 1860, as Marx has written, the middle landscape continued to influence not only American thought but even the design of cities and suburbs. An example is the work of landscape architect Frederick Law Olmsted, who is responsible for such urban oases as Central Park.

In the section of Future Imperfect devoted to literary visions of technology, Segal finds that Mizora by Mary E. Bradley, an obscure 1890 novel about a feminist utopia, also offers some insight into how we have come to terms with technology. Many more recent feminist utopias, such as Ursula LeGuin's The Left Hand of Darkness and Marge Piercy's A Woman on the Edge of Time, are set in pastoral, pre-industrial or nonindustrial societies and reflect what Segal sees as simple-minded notions of technology. But the Mizorans, who have managed to do entirely without men, have also achieved a sustainable world that is both highly industrialized and ecologically sound. Much of what makes this possible is that education is the predominant value in Mizora. Indeed, teachers are the most highly paid members of society.

Interestingly enough, Segal spends a good deal of another section, the one on technological museums, exploring the part education has played in a



decidedly non-utopian world. Particularly engaging is his look at the Armington and Sims Machine Shop, originally located in Lawrence, Mass., and recently reconstructed as an exhibit at Greenfield Village in Dearborn, Mich. The need for machine shops stemmed from the growing mechanization of the textile industry in Britain and the United States in the late eighteenth and nineteenth centuries. Eventually, such shops not only produced steam engines, locomotives, and machine tools, but, through the apprentice system, served to train machinists and mechanical engineers. In the process, Segal points out, they nurtured a predominantly WASP, exclusively male social and technical elite: the white male artisans were inclined to take mainly other white males under their wing, and the close, mentoring relationship that ensued served to cement the association of like with like. Not until the time of the Civil War did the role of the machine shop begin to be challenged more egalitarian engineering schools, in which instruction derived from science-based knowledge and entailed reading books and attending lectures rather than chummy hands-on training.

#### Skewering the Prophets

As Segal moves on to the twentieth century, he shifts his attention to the phenomenon of "high tech," discussing the uses, misuses, and, often, non-uses of history in a range of situations. For example, Xerox, Apple, Bell South, and other companies are castigated for advertising in which they attempt to associate themselves with historical figures from Michelangelo to civil rights leader Ralph Bunche. IBM is taken to task for using Charlie Chaplin's "Little Tramp," whose films satirized the industrial society of their time, to sell PCs.

This line of argument may strike some as a bit querulous, since the firms are simply promoting their products, not purporting to teach history or predict the future, but Segal is on much more solid ground when he confronts commentators who apparently do aspire to those goals. Futurists such as Alvin Toffler, coauthor of the bestseller *Future Shock*, and John Naisbitt, who wrote the popular *Megatrends* books, are justly skewered for their failure to read and understand the history of the phenomena on which they prophesy.

Discussing Megatrends 2000, for instance, Segal bristles at the statement that "by identifying the forces pushing the future, rather than those that have contained the past, you possess the power to engage with your reality." He remarks that "it is as if high tech arrived and flourished in a historical vacuum of no more than a few decades and as if everything before it can forever be forgotten." These observers, he says, extrapolate from the present to the future without working toward any real understanding of the past, and replace serious thought with jargon like "massive adaptational breakdown" and "premature arrival of the future."

According to Segal, one of their main mistakes is that they view technology simplistically as an exogenous force operating on society, when in truth technology and society shape each other in complex ways. Such a limited perspective precludes taking any kind of moral position on technological developments. After all, if technology shapes society without ever being shaped itself, then whatever choices people make are irrelevant.

Yet as much as writers like Toffler and Naisbitt disturb Segal, he saves his parting shot for the advocates of technological literacy, a growing movement in higher education that seeks to build bridges between the "two cultures" of science and the humanities. Most technological literacy programs neglect to incorporate history in their teaching and research, he writes, and those that do incorporate it focus only on the positive side of technology.

Segal suggests that a more balanced

account is in order: "The real lesson to be learned from the serious study of technology's past is that technological progress and social progress do not necessarily go hand-in-hand but often conflict." Grasping that lesson will give students a more critical perspective on how technology might affect the nation's future, he believes. This, in Segal's view, would be genuine technological literacy. It is a worthy objective and one to which Future Imperfect will certainly make a contribution.

ALBERT H. TEICH heads the Directorate for Science and Policy Programs at the American Association for the Advancement of Science. His anthology Technology and the Future is now in its sixth edition (St. Martin's Press, 1993).

generation technologies proposed by the authors would be exceedingly risky. The likelihood that technologies developed in the past decade can be immediately placed in large-scale commercial use in a reliable—let alone economical—way is low.

DAVID F. PRITCHARD Columbus, Ohio

Although Flavin and Lenssen argue that competition will accelerate the introduction of new electric generating technologies, such an outcome is far from guaranteed. In a world where environmentalists oppose wind power out of concern for "avian mortality" and the public fears electromagnetic fields, the not-inmy-backyard philosophy prevails. The inability to obtain sites for clean and efficient new technologies may eliminate the technological advantages of an electric industry restructuring.

Renewables, energy efficiency, and smart technologies are also doomed if the U.S. electricity industry restructures itself to resemble that of the United Kingdom, where a power pool functions as a broker in the transfer of electricity between generators and the utilities whose only concern is price. Consumers then use whichever type of electricity has been purchased by the utilities. Without choice in the electric industry, consumers would be unable to signal power plant developers about the type of generation they would like in the future; those who would want to pay more for "green" electricity would be unable to do so. Consumers would also lose the benefits of a generation portfolio that protects them from fluctuations in fuel prices.

> Stephen R. Connors Director Electric Utility Program MIT

#### SOLAR POWER'S PROSPECTS

In his accounts of the field's earliest pioneers in "Revisiting Solar Power's Past" (TR July 1995), Charles Smith shows that solar's viability depended more on larger trends in the energy industry than on inventors' ability to contain costs. Decentralized sources of power, includ-

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ing solar, cogeneration, and windpumps, withered in twentieth-century America because the electric industry steadily lowered real prices by building ever larger and more efficient gen-



erators. Due to a confluence of factors, real electricity prices began to rise in the late 1960s, and, in 1978, legislation offering incentives to non-utility power pro-

ducers started the deregulation of the electric industry, which is still under way. Solar's renewed prospects are a result of this changing environment.

The success of solar power in coming years will depend on whether regulators and consumers include the environmental and geopolitical costs of power in the price of electricity. Solar advocates plead for a level playing field, thereby allowing solar power to compete on its merits. Unfortunately, some recent proposals to restructure utilities call for an electric industry in which different suppliers compete to serve customers. While some consumers might opt to pay more for "green" electricity produced by environmentally sound means, most would choose the cheapest rate—probably favoring natural gas. Although natural gas is environmentally preferable to other conventional fuels, it lacks the attractive features of solar power outlined by Smith. The trick will be to obtain maximum innovation and efficiency from deregulation while structuring the market so that players have incentives to factor long-term consequences into their decisions.

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# Phenomena

By David Brittan

# The Shadow of Your Smiley

In an age when letters are posted with a prayer, it is easy to suppose that languorous delivery is a permanent feature of the mail, like dog bites and battered leather bags. But it wasn't always so. When William Dockwra, a London entrepreneur, set up the first urban postal system—complete with local collection and delivery, prepaid mail, and postmarking—the mail came almost every hour. Letter carriers of the Penny Post, as it was called, made six to eight deliveries daily in central London and four in the rest of the city. The year was 1680.

By the end of the last century, post offices in Berlin, Paris, and other European cities had begun gusting mail across town in underground pneumatic tubes. Philadelphia copied this system in 1893, laying a half-mile pair of tubes (one for each direction) that propelled bundles of mail in six-inch-wide cannisters. New York followed suit with several miles of tubing that could move 360,000 letters per hour. This innovation produced excellent service wherever it was adopted. In the Milan of 1890, for example, mail was delivered five times a day. The science writer Charles C. Mann notes in Inc. Technology magazine (summer 1995) that this hyperkinetic schedule enabled the opera composer Giuseppe Verdi and his librettist, Arrigo Boito, to maintain a fruitful collaboration largely by post. When Verdi fired off a plot suggestion in the morning, he could expect to receive a reply, and even to answer the reply,

before the day was out.

Mann compares the letter mail of the 1890s to the e-mail of the 1990s, and with evident justification.

Correspondence was fast and spontaneous, a conversation in written form.

And in the absence of body



language and vocal inflection, the recipient had only words on paper by which to gauge the sender's mood or intent. The same can no doubt be said of the earlier Penny Post.

All of which presents something of a mystery. Despite their resemblance to modern electronic communicators, the letter writers of yesteryear—whom I imagine to have scribbled mountains of hasty notes in anticipation of making the return mail—never once, to my knowledge, saw the need to resort to anything like a "smiley."

Smileys, also known as emoticons, are a class of icons with which many e-mail writers and online conversationalists attempt to label the "mood" of their words. Through clever typography-and the willingness of readers to tilt their heads to one side—it is possible to convey in a few keystrokes a reasonable facsimile of a smile [:-)], a frown [:-(], or a wink [;-)]. And new emoticons are appearing all the time; a veritable cottage industry has devoted itself to their creation, dissemination, and emblazonment on T-shirts and mugs.

To their proponents, smileys are indispensable for "clarifying meaning"—for avoiding the misunderstandings and flare-ups that can mar electronic dialogue. "When you speak to someone face to face or over the phone, changes in your tone of voice and gestures help convey your mood," notes an e-mail guide for a major research institute. "These audio and visual cues are missing with e-mail." Scott Fahlman, a Carnegie Mellon University computer scientist,

assures me that the substitution of ersatz cues has had a calming effect: "Fewer fights start due to misunderstandings (saving people's energy for more interesting fights), and some people have fun with these things." Fahlman ought to know; he is credited with inventing the three basic smileys, in 1981. "I don't see a lot of downside," he concludes.

Fahlman obviously isn't looking hard enough. Though aficionados will tell you that the glyphs can express hundreds of emotions, nearly all, like ]:-> (the devil) and :/7) (Cyrano de Bergerac), prove to be not so much emotional states as people with funny objects stuck to their heads. That leaves smiley, frowny, and winky to sum up the human condition. Among the icons that are actually serviceable, the cloving scent of 1970s have-a-nice-day-ism is hard to ignore: a smiley in a serious e-mail message has the elegance of a bobbing hula doll in the back of a Rolls-Royce.

Beyond mere bad taste, a movement is afoot to mandate the use of smileys-or similar eye-rolling, elbow-nudging devices for sucking all the subtlety and risk out of communicatingas a matter of "netiquette." The aforementioned e-mail guide advises: "If you mean something as a joke, say so. You can do that by typing '(joke)' or '(grin)' or '(kidding!).' " An e-mail handbook from an esteemed midwestern university warns: "Be aware of irony, humor, and satire. . . . Try to mark yours appropriately—the use of emoticons is one way to accomplish this."

This sanctimonious poppy-

cock might be forgiven if people were as inept, and e-mail as radically novel, as the guidelines' authors imagine. One premise for labeling is that ordinary mortals are incapable of writing clearly, of detecting irony, and of surviving (and even learning from) misunderstandings. Another is that online communication leads these inarticulate souls into uncharted territory, a land of rapid banter where words will fail them and only their winkies afford protection.

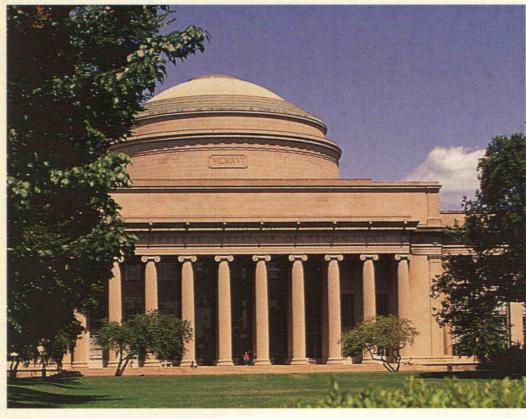
But this brave new world is as old as the Penny Post. Older. It was summoned into being whenever people of average literary ability, without recourse to "audio and visual cues," dashed off a few lines. It is in this world that we encounter the 80-year-old Verdi, mortified at having presented an autographed portrait to the wrong person. "In a fury," he wrote to a friend, "I took a revolver (it was made of chocolate) and fired it into my mouth. And I still live!!!" Somehow, even without the socially responsible smiley as a tip-off, Verdi's friend knew the old man was pulling his leg.

The proven success of vernacular media says that many of today's online writers are selling themselves short. By relying on a handful of rubber-stamp "emotions," they deny themselves the challenge and the satisfaction of finding the right words. They also risk turning the online world into a poorer, less human place than it can be. Already, a senior executive of a financial services firm, writing in a national magazine, can say with a straight face: "At [my company] we have a rule: no one argues on e-mail, and sarcasm is verboten."

Granted, the late-twentiethcentury fire sale on long-distance phone rates has made rusty correspondents of us all. But with the advent of e-mail, opportunities to rediscover the power of the written word have never been greater. Perhaps it's time to stop making faces and learn how to communicate.

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